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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 823

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Washington, D. C. PROFESSIONAL PAPER May 24, 1920

EXPERIMENTS WITH KHERSON AND SIXTY-DAY OATS

By

C. W. WARBURTON, Agronomist in Charge, and T. R. STANTON
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Office of Cereal Investigations

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SCOPE OF THE INVESTIGATIONS.

Extensive varietal experiments with Kherson and Sixty-Day oats have been conducted in the United States during the past 15 years. Prior to 1900 these varieties were practically unknown in this country, but to-day they are probably more generally grown than any of the older varieties. In this comparatively short time they have become widely distributed and are now of great commercial importance.

The general popularity of these oats must be attributed largely to their early maturity and their ability to produce high yields. In sections where oats are grown primarily for market they have not met with favor because of their yellow color, but the small thin-hulled grains are highly regarded by farmers for feeding.

Varietal experiments including the Kherson and the Sixty-Day oats have been conducted by the State agricultural experimental stations and the United States Department of Agriculture for periods varying

from 4 to 14 years. The large mass of data now available indicates quite definitely the adaptability of these varieties to the different sections of the United States and their value in comparison with other oats. It is the purpose of this bulletin to assemble these data and to present such conclusions as they appear to warrant.

SOURCES OF DATA.

Three sources of data have been drawn upon for this publication, viz, the results of experiments conducted independently by the United States Department of Agriculture, of those conducted cooperatively by the United States Department of Agriculture and the State agricultural experiment stations, and those conducted independently by the State agricultural experiment stations. Data from the last-mentioned source are included in order to present fully the present status of the Kherson and Sixty-Day varieties in the United States. Full credit is given in all cases where such data are used. In a number of instances where results have not been published recently the experiments have been summarized for this bulletin by officials of the various stations.

The data presented herein have been obtained under a wide range of climatic and soil conditions. However, the varietal yields obtained at any one place should be fairly comparable, while the data from several stations in the same general area supplement each other. At nearly all stations the aim has been to grow the varieties in the varietal experiments under conditions similar to those on the best farms in the localities where the experiments were conducted.

Those experiments which have been conducted under similar conditions have been grouped whenever practicable. The results obtained in the eastern half or humid portion of the United States are presented first, followed by those obtained in the western half or semiarid portion, including the results of a few experiments on irrigated land.

In addition to the presentation of data on yield of grain, brief statements on yield of straw, weight per bushel, percentage of hull, and the improvement of Kherson and Sixty-Day oats are included in this bulletin.

HISTORY OF KHERSON AND SIXTY-DAY OATS.

Both the Kherson and the Sixty-Day oats were introduced into the United States from southern Russia. The first lot of the Kherson oats sent to this country was obtained by the Nebraska Agricultural Experiment Station (24)[1] in 1896 through Prof. F. W. Taylor, then superintendent of farmers' institutes in Nebraska, while traveling through Russia. As it was obtained in the Kherson Govern-

[1] The serial numbers in parentheses refer to "Literature cited" at the end of the bulletin.

ment, the name "Kherson" was given to it. Seed of the Sixty-Day variety was received by the Office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry [1] on March 6, 1901, from Dr. S. de Mrozinski, of Proskurov, in the Podolia Government of Russia. This province is adjacent to and just west of the Kherson Government, and has essentially the same climatic and soil conditions. Both these varieties have been widely distributed in the United States, though probably the Sixty-Day is most widely grown. The origin of the Kherson oat is not definitely known. The Sixty-Day is said to have been originated by Dr. Mrozinski, but no information is at hand regarding the source of the material from which he made his selection. It is very probable, however, that the Kherson is from the

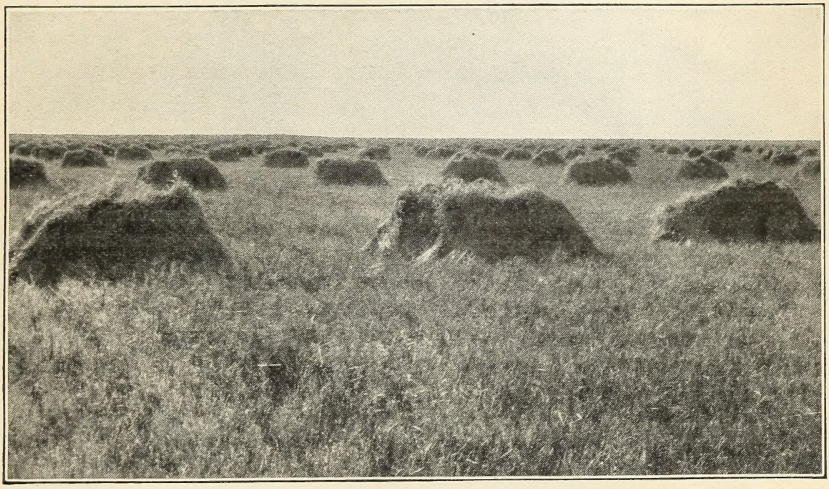

FIG. 1.—A field of sixty-day oats in shock near Dickinson, N. Dak.

same original stock, as the two varieties are practically identical in every way and were obtained from adjoining provinces. A field of Sixty-Day oats in shock near Dickinson, N. Dak., is shown in figure 1.

A brief account of the section of Russia from which these varieties were obtained will be of value for comparison with soil and climatic conditions in the United States. As is pointed out in the following quotation from Carleton (9, pp. 8, 9), the Russian grain-producing region, of which the Kherson and Podolia Governments

[1] "S. P. I. No. 5938, *Avena sativa*. From Proskurow, Russia. Received through Dr. S. de Mrozinski March 6, 1901. Sixty-Day, originated by Dr. Mrozinski." (47, p. 44.)

An earlier importation from Dr. Mrozinski was unnamed, but undoubtedly is identical with the Sixty-Day. It was grown at a few agricultural experiment stations under the name of "Seventy-five Day," but was not widely distributed and soon became merged with the introduction just mentioned. The exact date when this importation was made is not stated in the record, but it was about June 1, 1900. The record is as follows:

"5168. *Avena sativa*. From Proskurow, Russia. Presented by Dr. S. de Mrozinski. An early variety which ripens within 75 days from the seed." (46, p. 57.)

are a part, is very similar to our upper Mississippi Valley and central Great Plains areas.

The soil of the greater portion of the grain region of Russia and Siberia is well known in that country as the "Chernozem" or "black earth." It is a broad belt of prairie, 600 to 700 miles in average width, beginning in Hungary and extending northeastward to the Ural Mountains, and then eastward into Siberia to unknown boundaries. On the north and west are "the gray forest lands" and on the south and east are salt and alkaline districts and sandy wastes, and finally the Caucasus and Ural Mountains. By both chemical and mechanical analyses the soil is shown to be remarkably similar to that of our own prairies, also commonly known by the similar term of "black loam." The depth is on an average, probably a little greater than that of our prairie soil. * * *

The similarity between the Russian steppes and the Great Plains is fully as great in climate as in soil, both regions being emphatically continental and subject to great extremes of temperature and moisture. In the greater portions of the two regions the winters are long and very severe, while the summers, though short, are intensely hot. Other noteworthy features of the climate are (1) the great number of clear days in the year, (2) the extreme amount of precipitation during two or three months of the summer as compared with that of the remainder of the year, (3) the character of this precipitation, falling in quick thunderstorms, as a rule, with very few days of mists or fogs, (4) the excessive heat of midsummer, following intensely cold winters, as already mentioned, and (5) the comparatively light snowfall. These features, while common to the two regions, are considerably more pronounced for corresponding portions of the grain belt in Russia than in the United States. For this reason varieties brought from Russia are all the better adapted for cultivation in this country, as they are already used to even more rigorous conditions of climate than they will have to endure here. The snowfall, as a rule, is less on the Russian steppes than on the Great Plains. The rainfall is generally considerably less, and the extremes of temperature a little greater.

DESCRIPTION OF KHERSON AND SIXTY-DAY OATS.

Botanically, the Kherson and the Sixty-Day oats can not be distinguished one from the other. Typical panicles and spikelets of these varieties are shown in figure 2. While these so-called varieties sometimes differ considerably in yield when grown under the same conditions, the difference is often no greater than that between two commercial strains of the same variety. Since the varieties are identical and the names, therefore, are synonymous, only one description is given.

Kherson, or Sixty-Day.—Early growth erect. Culms slender, stiff, glabrous or slightly pubescent at the nodes, 75 to 110 cm. tall. Sheaths deep green, glabrous; culm leaves 4 to 6, narrow, fine. Peduncle slender, straight, 30 to 45 cm. long, well exserted. Panicle equilateral, short, ovate; rachis nodes 6 to 7; branches short, slender, ascending, scabrous. Spikelets 25 to 50 or more, usually 2-flowered, sometimes 3-flowered. Empty glumes 20 to 22 mm. long, 5.5 to 6.5 mm. wide, usually 9-veined, grayish green before maturity. Lower lemma 14.5 to 16.5 mm. long, narrow, glabrous, varying from deep yellow to nearly white, the yellow predominating but becoming paler in semiarid sections or in dry years; basal hairs few or wanting; awns few or wanting, slender, weak, 20 to 25 mm. long. Upper lemma 10.5 to 12 mm. long, slender, plump, awnless.

The Kherson and Sixty-Day are early in maturing, ripening from 90 to 100 days after sowing, or about 10 to 15 days earlier than most other varieties. It is the earliness of these varieties which has made

FIG. 2.—Panicles and spikelets of two early yellow varieties of oats; 1, Kherson; 2, Sixty-Day.

them particularly valuable in the corn belt and in the Great Plains area. Because of their earliness they are enabled to escape to some extent injury by drought, storms, and rust.

EXPERIMENTAL DATA.

While experiments with the Kherson and Sixty-Day oats were begun soon after their introduction into this country, these oats were not generally grown in varietal experiments in field plats until about 1904. Within the following three or four years these varieties were generally included in varietal experiments by the agricultural experiment stations, particularly those in the corn belt and in the Great Plains area. Some of these experiments are still in progress, while others have been discontinued. Most of these experiments were continued long enough to furnish definite evidence regarding the adaptability of the variety to the locality.

VARIETAL EXPERIMENTS IN THE EASTERN HALF OF THE UNITED STATES.

Kherson and Sixty-Day oats have been included in practically all the varietal experiments with spring oats conducted in the eastern half, or humid area, of the United States. Results obtained at 23 experiment stations located in 17 States are presented herein. For the most part, these experiments have been conducted in the North-Atlantic, the east North-Central, and the west North-Central groups of States.

The experiments at Ithaca, N. Y., Ames, Iowa, McPherson, Kans., and Brookings, S. Dak., have been conducted cooperatively by the United States Department of Agriculture and the State agricultural experiment stations of those States, respectively. The experiments at Orono, Me., Durham, N. H., State College, Pa., Wooster, Ohio, La Fayette, Ind., De Kalb, Fairfield, and Urbana, Ill., St. Paul, Crookston, and Grand Rapids, Minn., Fargo, N. Dak., Lincoln, Nebr., Manhattan, Kans., Knoxville, Tenn., Carthage, Mo., Fayetteville, Ark., and Denton, Tex., have been conducted independently by the agricultural experiment stations of the respective States.

In order to interpret experimental results properly, a knowledge of the principal physical factors influencing plant growth is essential. Such information as is available regarding these factors is shown in Table I.

According to the data shown in Table I, the average annual precipitation exceeds 40 inches at Orono, Me., Knoxville, Tenn., and Fayetteville, Ark. At the remaining stations except those in Minnesota, the Dakotas, and Nebraska, the average annual precipitation is above 30 inches. Though occasional droughts occur, some of which are so long continued and so severe as to cause serious damage, the rainfall throughout this area is usually sufficient for crop growth.

In most of the area under discussion summer temperatures are high. Except in New England and the Dakotas the mean tempera-

ture during July is about 70° F. at all stations and above this point during August at all except a few. The mean temperature during June ranges from 61.9° at Orono, Me., to 78.7° at Denton, Tex., exceeding 70° as far north as Indiana, Illinois, and Nebraska.

TABLE I.—*Altitude, average annual precipitation, mean seasonal temperatures, and general soil types at 23 experiment stations in the eastern half of the United States.*

[The circled figures in column 4 indicate the number of years during which the data were recorded when such period was more than the number of years shown in column 3.]

Station.	Altitude.	Climatological data.					Soil type.
		Length of record.	Average precipitation.	Mean temperatures (°F.).			
				June.	July.	Aug.	
1	2	3	4	5	6	7	8
	Feet.	*Years.*	*Inches.*				
Orono, Me.	129	35	㊵ 43.18	61.9	66.9	65.0	Light, sandy loam to medium clay loam.
Durham, N. H.[1]	.....	38	㊺ 39.82	64.4	69.1	66.6	Clay and clay loam.
Ithaca, N. Y.	800	31	㊸ 32.97	66.2	70.6	68.2	Clay loam and gravelly loam.
State College, Pa.	1,191	21	㉕ 38.94	66.9	70.7	68.7	Clay loam (Hagerstown).
Wooster, Ohio.	1,030	24	㉟ 38.73	67.8	71.4	68.9	Silt loam.
La Fayette, Ind.	617	29	38.29	70.7	74.6	72.6	
De Kalb, Ill.[2]	.....	28	35.64	67.8	71.9	69.6	Brown silt loam.
Fairfield, Ill.	495	15	⑱ 38.61	73.6	77.8	75.9	Gray silt loam or light clay.
Urbana, Ill.[3]	.....	24	35.74	70.8	74.8	72.7	Brown silt loam.
Madison, Wis.	974	31	㊶ 31.25	67.3	72.0	69.8	
St. Paul, Minn.	848	38	㊸ 27.80	67.2	72.0	69.7	
Crookston, Minn.	863	20	23.01	63.5	68.2	65.8	Clay loam (Fargo) and fine sandy loam (Fargo).
Grand Rapids, Minn.[4]	.....	22	28.05	.....	.....	.....	
Fargo, N. Dak.[5]	935	28	24.91	64.0	67.8	65.8	
Brookings, S. Dak.	1,636	20	㉑ 20.66	64.5	69.4	67.6	Sandy loam.
Ames, Iowa[6]	.....	15	32.86	.....	.....	.....	Black prairie loam.
Lincoln, Nebr.	1,189	26	㉞ 28.43	71.2	75.8	74.8	
Manhattan, Kans.	1,100	47	㊶ 31.12	74.5	78.7	76.8	
McPherson, Kans.	1,495	17	㉖ 32.32	73.5	78.1	78.5	Sandy loam.
Carthage, Mo.[7]	.....	31	41.55	.....	.....	.....	Brown silt loam (Crawford).
Fayetteville, Ark.	1,451	18	㉓ 46.76	73.7	77.4	76.3	Heavy clay and clay loam.
Knoxville, Tenn.	977	33	㊸ 48.35	73.4	76.2	74.7	
Denton, Tex.[8]	.....	9	⑮ 34.45	78.7	82.3	81.8	

[1] Data recorded at Concord, about 30 miles northwest of Durham; altitude at Concord, 350 feet.
[2] Data recorded at Sycamore, about 6 miles northeast of De Kalb; altitude at Sycamore, 855 feet.
[3] Data recorded at Philo, about 8 miles south of Urbana; altitude at Philo, 700 feet.
[4] Data recorded at Pokegama Falls, about 7 miles northwest of Grand Rapids; altitude at Pokegama Falls, 1,290 feet.
[5] Data recorded at Moorhead, just opposite Fargo, in Minnesota; altitude at Moorhead, 935 feet.
[6] Data recorded at Ogden, 22 miles west of Ames; altitude at Ogden, 1,134 feet.
[7] Data recorded at Carthage 16 years; at Sarcoxie, about 13 miles southeast of Carthage, 8 years; and at Joplin, about 13 miles southwest of Carthage, 7 years; altitude at Joplin, 979 feet.
[8] Data recorded at Decatur, about 30 miles west of Denton; altitude at Decatur, 1,047 feet.

RESULTS IN THE NORTH ATLANTIC STATES.

In New England, the agricultural experiment stations of Maine and New Hampshire report varietal experiments with Sixty-Day and Kherson oats. The former station has conducted a rather extensive series of experiments with oats since 1910, including both commercial and pure-line strains of the Kherson variety. No recent varietal work has been reported by the New Hampshire station, but a limited number of varieties, including the Sixty-Day, were tested in 1904 and in the 4-year period from 1906 to 1909, inclusive.

The New York (Cornell) and the Pennsylvania agricultural experiment stations also report varietial experiments which include the Kherson and Sixty-Day oats.

Results in Maine.

The annual and average yields of the Kherson and of seven other varieties of oats grown at the Maine Agricultural Experiment Station at Orono (41, 42, 43) during the 6-year period from 1910 to 1915, inclusive, are shown in Table II.

TABLE II.—*Annual and average yields of the Kherson and of seven other commercial varieties of oats grown at the Maine Agricultural Experiment Station (at Orono) during the 6-year period from 1910 to 1915, inclusive.*

[Data compiled from Maine Agricultural Experiment Station Bulletins 229 and 250 (41 and 43).]

Group and variety.	Yield per acre (bushels).						
	1910	1911	1912	1913	1914	1915	Average.
Early yellow: Kherson	69.4	47.8	52.7	60.8	82.7	66.8	63.4
Midseason yellow: Imported Scotch[1]	60.0	62.4	62.2	67.7	87.1	64.8	67.4
Midseason white:							
Banner	70.8	45.8	62.6	62.7	94.5	81.8	69.7
Prosperity	65.5	52.8	67.4	63.0	92.1	74.1	69.2
Irish Victor	70.5	55.6	61.6	67.0	82.4	76.2	68.9
Swedish Select	72.1	40.9	56.5	60.9	79.9	68.3	63.1
Late white (side): Senator	53.5	38.3	53.5	51.7	83.6	57.9	56.4

[1] The identity of this variety is not definitely known.

The data in Table II show rather conclusively that the midseason varieties outyield the Kherson at Orono. Banner and Prosperity, the leading midseason varieties, have exceeded the Kherson in 6-year average yield by 6.3 and 5.8 bushels, respectively. On the other hand, the Kherson has outyielded the Senator, a late side oat, by 7 bushels.

Several pure lines of the Kherson have been tested at the Maine station, but proved to be decidedly inferior to pure lines of Banner, Irish Victor, and Imported Scotch and therefore were discarded.

Results in New Hampshire.

The annual and average yields of the Kherson and four other varieties of oats grown at the New Hampshire Agricultural Experiment Station at Durham (44, p. 141–146) for two or more years of the 4-year period from 1906 to 1909, inclusive, are given in Table III. Although several varieties were grown in 1904, no data on yields are available, as all varieties were destroyed by rust.

The data in Table III are not sufficient to determine the value of the Kherson oat for New Hampshire conditions. However, they indicate that the early varieties are of some promise, because they usually escape the rust and for that reason may outyield the midseason varieties in a series of years. In the two years for which

yields of Kherson are reported it averaged slightly better than any other variety.

TABLE III.—*Annual and average yields of the Kherson and four other varieties of oats grown at the New Hampshire Agricultural Experiment Station (at Durham) during two or more years in the 4-year period from 1906 to 1909, inclusive.*

[Data compiled from New Hampshire Agricultural Experiment Station Bulletin 145 (44, p. 141–146).]

Group and variety.	Yield per acre (bushels).					
	1906	1907	1908	1909	Average.	
					1906 to 1909	1908 and 1909
Early yellow: Kherson	.....	.....	34.6	36.6	.....	35.6
Midseason yellow:						
Hamilton	31.6	68.1	25.5	31.9	39.3	28.7
Welcome [1]	38.1	52.5	24.3	40.0	38.7	32.2
Midseason white: Lincoln	24.1	57.5	31.0	35.8	37.1	33.4
Late white (side): Long's White Tartar	35.3	68.7	31.5	33.1	42.2	32.3

[1] The true Welcome is a midseason white variety.

Under date of November 26, 1917, Prof. F. W. Taylor, agronomist, writes:

We have not grown any Kherson oats since 1909, and for that reason have no data other than that published in Bulletin 145. Everything considered, I do not think the Kherson oat is as well adapted to New Hampshire as some other strains like the Lincoln and Long's White Tartar. What we need here is an oat that does not run too much to straw and one which has at least some rust-resisting qualities.

Results in New York.[1]

At the Cornell University station (Ithaca) (23) the oat varietal experiments have been conducted in cooperation with the United States Department of Agriculture since 1907. While several pure-line selections of the Sixty-Day oat have been included in these experiments, only one (No. 5938–1) has been of sufficient promise to warrant its retention throughout the entire 11-year period from 1907 to 1917, inclusive. The annual and average yields of two pure-line selections of the Sixty-Day, six selections from other varieties, and two unselected commercial varieties grown at Ithaca in seven or more years of the 11-year period from 1907 to 1917, inclusive, are shown in Table IV.

The data in Table IV indicate clearly that the midseason white varieties will outyield the early yellow varieties in New York. The difference between the highest yielding Sixty-Day selection (5938–1) and the Welcome selection (123–5), the leading variety at Ithaca, is 4.2 bushels. However, the Sixty-Day selection approaches the midseason varieties more closely in yield than might generally be expected and in unfavorable years may surpass them.

[1] Data since 1913 are from unpublished annual reports of Dr. H. H. Love, collaborator, and Mr. W. T. Craig, agent, to the Office of Cereal Investigations.

TABLE IV.—*Annual and average yields of two pure-line selections of the Sixty-Day variety, six other pure-line selections, and two commercial varieties of oats grown at the Cornell University Agricultural Experiment Station, Ithaca, N. Y., during seven or more years in the 11-year period from 1907 to 1917, inclusive.*

Data obtained in cooperation with the Cornell Agricultural Experiment Station.]

Group and variety.	Pedigree No.	Yield per acre (bushels).													
		1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Average.		
													1907 to 1913	1907 to 1917	1911 to 1917
Early yellow:															
Sixty-Day selection	[1]5938–1	60.0	55.0	56.9	57.5	49.5	55.2	55.7	51.6	73.6	43.4	47.7	55.7	55.1	53.8
Do	62–II–6–2	63.7	65.0	43.3	59.8	50.2	41.5	46.3	....	....	....	....	52.8	....	....
Early white:															
Pringle Progress selection	131–19	37.5	40.0	35.7	50.6	54.4	56.5	55.7	....	....	....	....	47.2	....	....
Early red:															
Burt selection	33a1–15	41.2	58.7	44.2	64.8	47.2	51.4	53.8	....	....	....	....	51.6	....	....
Do	63–I–4	42.5	57.5	39.9	62.3	46.2	50.2	52.4	....	....	....	....	50.1	....	....
Midseason white:															
Welcome selection	123–5	53.7	67.5	46.8	61.2	64.0	69.8	68.9	46.1	80.4	48.9	45.3	61.7	59.3	60.5
Silvermine selection	125–20	52.5	40.0	43.6	56.0	88.4	72.9	68.2	43.1	76.2	49.2	45.2	60.2	57.8	63.3
Do	120–9	57.5	42.5	48.3	62.7	62.0	67.3	69.5	45.8	75.2	47.3	39.6	58.5	56.2	58.1
Silvermine [2]	....	....	....	....	....	70.7	66.3	71.3	44.2	76.6	44.9	48.3	....	....	60.3
Lincoln	....	....	....	....	....	58.9	70.4	70.2	42.1	72.3	47.2	40.1	....	....	57.3

[1] The original strain, Seed and Plant Introduction No. 5938, is grown elsewhere under Cereal Investigations No. 165.
[2] Plant Breeding No. 1571.

In 1911, several representative unselected commercial varieties were added to the experiments at Cornell University, which previous to that time had included mostly pure-line selections from hybrids and from commercial varieties. Among these were Sixty-Day, Silvermine, and Lincoln. The unselected Sixty-Day yielded so much less than the selection 5938–1 that it was discarded at the end of three years, but the other two varieties are still included. The 7-year (1911–17) average yield of the Silvermine is 60.3 bushels; of the Lincoln, 57.3 bushels; and of the Sixty-Day selection (5938–1), 53.8 bushels.

Results in Pennsylvania.

The Pennsylvania Agricultural Experiment Station at State College (15) has included the Sixty-Day variety in its experiments since 1907 and the Kherson variety since 1909. The results to and including 1910 have been published. The annual and average yields of these and seven other varieties in two or more years of the 4-year period from 1907 to 1910, inclusive, are shown in Table V.

As shown in Table V, the Sixty-Day oat during the 4-year period from 1907 to 1910, inclusive, outyielded all others at State College. The 2-year data on the Kherson indicate that it will do equally as well as the Sixty-Day in central Pennsylvania.

No data on oat varietal tests have been published by the Pennsylvania station since 1911, but Prof. C. F. Noll, associate professor of experimental agronomy, has kindly summarized the more recent

investigations. In a letter dated December 11, 1917, he states that of 27 varieties grown during the seven years from 1911 to 1917 the Kherson ranks sixth and the Sixty-Day eighth. In the three years 1915, 1916, and 1917, however, these varieties rank first and third, respectively, among 30 varieties grown. In the 7-year period from 1911 to 1917, inclusive, the Fourth of July ranks first, with an average yield of 64.6 bushels to the acre. In the same period the Kherson averaged 63.0 and the Sixty-Day 62.2 bushels. In the three years, 1915, 1916, and 1917, Kherson ranks first, with an average yield of 78.4 bushels; New Zealand second, 75.9 bushels; Sixty-Day third, 75.8 bushels; and Fourth of July fourth, 75.7 bushels. In yield of straw the Kherson and Sixty-Day are consistently lowest of all, a characteristic which leads Prof. Noll to remark:

> In some sections where little or no wheat is grown and straw is relatively valuable we find these varieties objected to on account of their rather low yields of straw.

TABLE V.—*Annual and average yields of the Kherson, Sixty-Day, and seven other varieties of oats grown at the Pennsylvania Agricultural Experiment Station (at State College) during two or more years in the 4-year period from 1907 to 1910, inclusive.*

[Data compiled from Pennsylvania Agricultural Experiment Station Bulletin 108 (15).]

Group and variety.	Yield per acre (bushels).					
	1907	1908	1909	1910	Average.	
					1909–1910	1907–1910
Early yellow:						
Sixty-Day	68.7	55.0	56.9	77.5	67.2	64.5
Kherson	.....	.....	61.5	69.3	65.4	.....
Midseason white:						
Japan	65.3	[1]49.5	[2]57.5	[3]67.8	62.7	60.0
Fourth of July[4]	62.7	45.3	56.9	71.7	64.3	59.2
Czar of Russia	64.0	40.3	56.7	71.8	64.3	58.2
Big Four	64.4	44.5	58.8	64.8	61.8	58.1
Swedish Select	61.0	44.6	60.9	65.4	63.2	58.0
Midseason black:						
Joanette	63.2	51.5	62.0	66.0	64.0	60.7
Late white (side):						
Long's White Tartar	64.0	45.8	58.2	79.7	69.0	61.9

[1] Average of 12 check plats.
[2] Average of 8 check plats.
[3] Average of 13 check plats.
[4] Probably identical with Irish Victor.

Prof. Noll further states that where oats are sold the Sixty-Day and Kherson are objected to because of the small size and yellow color of their grain.

Conclusions.

The average yield of the leading variety in each group, at the stations included in the North Atlantic States, is shown graphically in figure 3.

The data presented in Tables II and III indicate that under New England conditions the midseason varieties will outyield the Kherson and the Sixty-Day. In Maine such varieties as Banner, Prosperity, and Irish Victor have averaged several bushels more than the Kherson

in a 6-year test. Yields of the Kherson have been reported for only two years at the New Hampshire station. In these years it has slightly outyielded the midseason varieties, but the data are too meager to justify any definite statement regarding its behavior over a longer period.

The results shown in Tables IV and V indicate that the early varieties, Kherson and Sixty-Day, are high yielders in the North Atlantic States. However, the midseason white varieties have outyielded the Sixty-Day under western New York conditions and are therefore recommended for that State. The results obtained at State College indicate that for the higher central and western

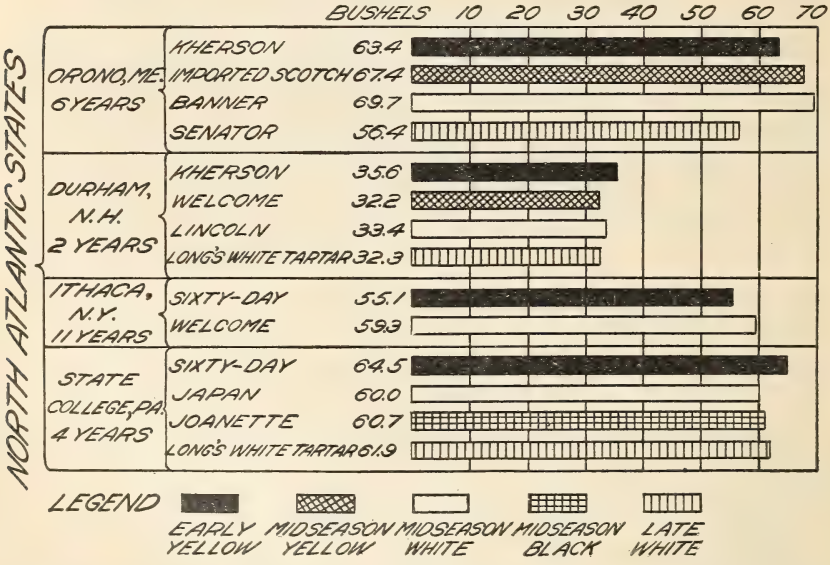

FIG. 3.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at four experiment stations in the North Atlantic States during the periods of years indicated.

portions of Pennsylvania and for western Maryland, northwestern Virginia, and West Virginia, the Sixty-Day and Kherson will probably outyield all other varieties.

RESULTS IN THE EAST NORTH-CENTRAL STATES.

The section designated as the east North-Central States includes the States of Ohio, Indiana, Michigan, Wisconsin, and Illinois. The agricultural experiment stations in all these States except Michigan have reported varietal experiments in which the Kherson, or Sixty-Day, or both have been included.

The Ohio station has included the Sixty-Day in very extensive varietal tests at Wooster since 1904. In 1908 two selections from the Sixty-Day were added. At the Indiana station both the Sixty-

Day and Kherson were grown from 1905 to 1908. Reports of varietal experiments at this station since 1908 have not included these varieties. At the Illinois station at Urbana the Sixty-Day has been grown since 1905, and it has also been included in varietal trials at De Kalb and Fairfield for several years. Yields of oat varieties at the Wisconsin station have not been published since 1907; both the Sixty-Day and the Kherson were grown that year and in the two years previous.

Results in Ohio.

The annual and average yields of three strains of the Sixty-Day and of thirteen other high-yielding varieties and selections grown at the Ohio Agricultural Experiment Station at Wooster (49 and 51) for five or more years of the 9-year period from 1904 to 1912, inclusive, are presented in Table VI.

TABLE VI.—*Annual and average yields of the original Sixty-Day variety, two selections from that variety, and thirteen other high-yielding varieties and selections of oats grown at the Ohio Agricultural Experiment Station (at Wooster) during five or more years in the 9-year period from 1904 to 1912, inclusive.*

[Data compiled from Ohio Agricultural Experiment Station Bulletin No. 257 (51).]

Group and variety.	Yield per acre (bushels).										
										Average.	
	1904	1905	1906	1907	1908	1909	1910	1911	1912	1908 to 1912	1904 to 1912
Early yellow:											
Sixty-Day	87.2	55.6	71.4	57.0	75.7	71.7	70.9	51.3	73.3	68.6	68.2
Sixty-Day selection, Ohio 7009 (white)	.....	.....	.....	.....	75.3	76.9	74.0	53.2	82.1	72.3	.....
Sixty-Day selection, Ohio 6106	.....	.....	.....	.....	68.5	77.6	73.8	59.0	77.1	71.2	.....
Midseason white:											
Siberian	93.7	65.1	78.9	49.1	65.6	71.4	76.6	67.4	74.3	71.1	71.3
Siberian selection, Ohio 6203	.....	.....	.....	.....	71.4	73.1	74.1	70.7	78.2	73.5	.....
Big Four	82.3	68.5	83.2	49.2	58.4	67.0	75.8	69.8	80.0	70.2	70.5
Silvermine	84.1	64.5	82.6	47.1	60.1	67.4	72.1	71.0	79.4	70.0	69.8
Improved American	85.7	59.5	87.2	45.5	67.2	73.5	63.5	65.8	77.1	69.4	69.4
Improved American selection, Ohio 6222	.....	.....	.....	.....	70.6	73.8	64.7	67.2	77.7	70.8	.....
Czar of Russia	71.7	63.7	81.6	45.7	71.0	70.0	66.9	61.9	79.7	69.9	68.0
American Banner	83.4	58.2	77.6	47.8	65.8	67.0	64.6	70.1	75.2	68.5	67.7
Lincoln	76.5	60.2	81.0	46.6	61.8	66.7	65.7	67.6	79.9	68.3	67.3
Green Mountain	82.5	59.0	88.1	45.0	68.9	69.3	53.6	59.0	77.1	65.6	66.9
Midseason black:											
Joanette	79.8	66.4	81.3	43.6	73.7	67.4	51.9	62.4	78.8	66.8	67.3
Late white (side):											
Long's White Tartar	73.7	44.3	87.0	50.6	51.1	66.1	76.9	64.7	72.0	66.2	65.2
Storm King	.....	.....	80.1	44.3	51.1	66.7	79.3	59.6	67.0	64.7	.....

Reference to Table VI shows that the Sixty-Day ranks fifth among the commercial varieties which have been tested at Wooster during the 9-year period from 1904 to 1912, inclusive, with an average yield of 68.2 bushels. The highest yielding variety in this period was the Siberian, with an average yield of 71.3 bushels. The Siberian is a midseason white oat, as are also the other three varieties which outyielded the Sixty-Day, viz, Big Four, Siberian, and Improved Amer-

ican. On the other hand, the Sixty-Day has outyielded the late white (side) oat White Tartar by a little more than 3 bushels per acre annually in the nine years that both varieties were grown.

In the most recent publication on oats issued by the Ohio station, the ten leading varieties with an 11-year average yield of 65 bushels or more are listed. Their rank, with yields for 1913 and 1914 added, was as follows: (1) Siberian, (2) Improved American, (3)Big Four, (4) Silvermine, (5) Green Mountain, (6) American Banner, (7) Sixty-Day, (8) Lincoln, (9) Czar of Russia, and (10) Joanette.

The two selections of Sixty-Day listed in Table VI have outyielded the parent variety by several bushels each. The higher yielding of the two selections has averaged 72.3 bushels, as compared with 73.5 bushels for the Siberian selection. The one other midseason white selection listed, that from Great American, has fallen below both the Sixty-Day selections in average yield. The behavior of these selections indicates that certain pure lines of the Sixty-Day are among the best for growing in Ohio under conditions similar to those at Wooster.

Results in Indiana.

In Table VII the average yields of the Kherson, the Sixty-Day, and eight other varieties for the 4-year period from 1905 to 1908, inclusive, are presented. Annual yields have not been reported by the Indiana Agricultural Experiment Station (50).

TABLE VII.—*Average yields of the Kherson, the Sixty-Day, and eight other varieties of oats grown at the Indiana Agricultural Experiment Station (at La Fayette) during the 4-year period from 1905 to 1908, inclusive.*

[Data compiled from Indiana Agricultural Experiment Station Newspaper Bulletin 147 (50).]

Group and variety.	Yield per acre.	Group and variety.	Yield per acre.
Early yellow:	*Bushels.*	Midseason white—Continued.	*Bushels.*
Sixty-Day	47.2	Goldmine	50.8
Kherson	42.4	Czar of Russia	50.5
Early red:		Big Four	50.0
Red Rustproof (Texas Red)	48.7	Improved American	49.5
Midseason white:		Green Mountain	49.3
Great Dakota	54.0	Lincoln	48.8

The results obtained at the Indiana station with early oats have been disappointing. The data in Table VII indicate that the Kherson and the Sixty-Day varieties were not high yielders at La Fayette, having been outyielded considerably by the best of the midseason white varieties. Of 34 varieties included in the varietal tests during the 4-year period from 1905 to 1908, 10 of which are listed in Table VII, the Sixty-Day ranked sixteenth and the Kherson twenty-ninth in average yield per acre. The one representative of the Red Rustproof group, Texas Red, as shown in Table VII, outyielded the Sixty-Day variety by 1.5 bushels in the 4-year period.

Results in Michigan.

No results of varietal tests of oats at the Michigan station have been published for many years. Such information as is available, however, indicates that midseason and late oats are to be preferred to the Sixty-Day and Kherson for growing in that State. The Worthy and the Success, midseason white varieties developed by the agricultural experiment station at East Lansing, are particularly recommended. In a recent letter, Prof. Frank A. Spragg, plant breeder of the Michigan station, says:

> We have had a number of strains of Sixty-Day and Kherson at various times in our varietal tests, but have never gotten as good yields as from the midseason and late varieties. Conditions in Michigan are quite different from those in the corn belt, where earliness in oats is desirable in order to enable them to ripen before hot summer weather. Our spring is often late, but when it opens everything comes with a rush, the hot spell usually striking us about July 1 and lasting two or three weeks. This hot weather injures the early oats. The oat that yields best with us is one that is not far enough advanced at this time to be hurt by hot weather and which heads out and ripens early in August immediately after the hot spell.
>
> Early oats should be of advantage in the Upper Peninsula of Michigan, because the season there starts late and rains in August are frequent, interfering with the harvesting of the later varieties. The Sixty-Day and Kherson are very unpopular, however, because farmers do not like the small, slender kernels.

Results in Wisconsin.

The results of varietal tests, including the Kherson and Sixty-Day oats, are reported for the years 1905 to 1907, inclusive, by the Wisconsin Agricultural Experiment Station (29). Since 1907 no tabulated results on varietal tests with oats have been reported. The annual and average yields of the Kherson and Sixty-Day and of three other varieties of oats grown at the Wisconsin Agricultural Experiment Station during the three years from 1905 to 1907, inclusive, are shown in Table VIII.

TABLE VIII.—*Annual and average yields of the Kherson, Sixty-Day, and three other varieties of oats grown at the Wisconsin Agricultural Experiment Station (at Madison) during two or more years in the 3-year period from 1905 to 1907, inclusive.*

Group and variety.	Wisconsin No.	Yield per acre (bushels).				
		1905	1906	1907	Average. 1906 and 1907.	Average. 1905 to 1907.
Early yellow:						
Sixty-Day	[1] 41	66.8	78.1	28.0	53.1	57.9
Kherson	49	.....	60.0	33.7	46.9	.....
Midseason white:						
Wisconsin Wonder	34	60.0	43.1	20.0	31.6	41.0
Swedish Select	[2] 4	50.0	39.0	12.5	25.8	33.8
Late white (side):						
White Russian	48	51.2	23.8	17.5	20.7	30.8

[1] Seed and Plant Introduction No. 12303 and Cereal Investigations No. 165.
[2] Seed and Plant Introduction No. 2788 and Cereal Investigations No. 134.

The data presented in Table VIII indicate that the early yellow varieties, Kherson and Sixty-Day, yielded well at Madison during the three years from 1905 to 1907, inclusive. In this period the Sixty-Day outyielded the Wisconsin Wonder, one of the leading midseason varieties, by about 17 bushels. This is much more than the normal difference between these varieties, however. The principal objection to the Sixty-Day and the Kherson oats at the Wisconsin station has been their rather weak straw and consequent liability to lodge. They are best adapted to the low and more fertile soils in the southern portion of the State, where they usually ripen in sufficient time to escape the most severe attacks of rust.

No report on experiments with oats has been published by the Wisconsin station since 1908, but in a letter dated December 5, 1917, Mr. B. D. Leith, assistant professor of agronomy at the University of Wisconsin, writes:

> We consider the Kherson oats particularly valuable under certain conditions. As a rule, we do not get as much lodging and rust, quite largely due to its earlier maturity. If it does lodge it fills out better than the Swedish Select when it lodges.
>
> Under adverse conditions it has been the highest yielding oat in our test plats. In 1915 it was harvested before our heavy storms lodged the other oats, and the yields ran above 100 bushels to the acre. In 1917 the yield was one of the best, largely due to the fact that it was not lodged so badly as the other oats, and there was less grain lost in harvesting. In very hot, dry years where oats are usually light the Kherson has been one of our best yielders.
>
> We have experimented with both Sixty-Day and Kherson oats. We pedigreed a strain from each and the pedigreed No. 7 selection from the Kherson strain proved a slightly heavier yielder and a little larger kernel than the pedigreed No. 6 from the Sixty-Day strain, so we disseminated the pedigreed No. 7 to the farmers and did not disseminate the pedigreed No. 6.
>
> Farmers in the sandy regions report that they are well pleased with the pedigreed No. 7 oats. It seems to be better suited to these regions than the midseason oats. I have in my hand a letter from a farmer on clay-loam soil who reports a yield of 80 bushels per acre from the pedigreed No. 7 oats last season. He states that it lodged considerably and if he had been able to save all the crop he feels sure that he would have received 100 bushels per acre. The real objection to this oats is that it can not command as high a price on the market as other oats. This man states that he will be obliged to take 3 cents a bushel less than he would for white oats.

Results in Illinois.

The Sixty-Day oat has been included in the varietal experiments at the Illinois station at Urbana (7) since 1905. This variety was also grown at De Kalb, in northern Illinois, during the four years from 1911 to 1914, inclusive, and at Fairfield, in southern Illinois, for several years. The Richland (Iowa No. 105), a yellow selection from the Kherson, was added to the tests at Urbana and De Kalb in 1915. The following year the Albion (Iowa No. 103), a white selection from the Kherson, was also grown at these two points.

RESULTS AT DE KALB.

The annual and average yields of the Sixty-Day, of two selections from the Kherson variety (Iowa No. 103 and Iowa No. 105), and of four other varieties of oats grown at De Kalb by the Illinois Agricultural Experiment Station in one or more years in the 10-year period from 1907 to 1916, inclusive, are shown in Table IX.

TABLE IX.—*Annual and average yields of three early and four midseason varieties of oats grown by the Illinois Agricultural Experiment Station (at De Kalb) during one or more years in the 10-year period from 1907 to 1916, inclusive.*

[Data compiled from Illinois Agricultural Experiment Station Bulletin 195 (7).]

Group and variety.	Yield per acre (bushels).										
										Average.	
	1907	1909	1910	1911	1912	1913	1914	1915	1916	1911 to 1914	1915 and 1916
Early yellow:											
Sixty-Day	37.8	.....	.....	57.7	62.2	41.1	55.7	.....	.....	54.2	.....
Albion (Iowa No. 103, white)	.....	.....	.....	.....	.....	.....	.....	67.6	69.6	.....	68.6
Richland (Iowa No. 105)	.....	.....	.....	.....	.....	.....	.....	.....	60.7	.....	.....
Midseason white:											
American Banner	28.8	.....	.....	57.1	77.9	61.5	43.3	61.6	65.4	60.0	63.5
Schoenen	26.6	.....	.....	55.7	77.2	64.9	47.2	63.8	71.1	61.3	67.5
Silvermine	32.2	.....	.....	53.6	76.4	63.8	49.0	78.4	62.6	60.7	70.5
Swedish Select	.....	52.9	78.4	50.6	70.0	48.0	47.5	62.8	59.3	54.0	61.1

The data shown in Table IX indicate that for northern Illinois the best midseason white varieties will outyield the early sorts. However, in 1915 and 1916 the Albion (Iowa No. 103), a white selection of the Kherson, has yielded nearly as well as the Silvermine and the Schoenen, the two leading midseason white varieties. This new oat appears to be of considerable promise for northern Illinois.

RESULTS AT URBANA.

The annual and average yields of four strains of early yellow and six other varieties of oats grown at the Illinois Agricultural Experiment Station at Urbana in one or more years during the 12-year period from 1905 to 1916, inclusive, are presented in Table X.

The data given in Table X show that in central Illinois the early varieties outyield all others and are therefore to be recommended. So far the original Sixty-Day has outyielded the Richland (Iowa No. 103), a yellow selection from Kherson. The Albion (Iowa No. 105), however, a white selection from the Kherson, materially outyielded both the Kherson and the Sixty-Day in 1916, the first year it was grown at Urbana. Both these pure lines of Kherson appear to be well worth growing in central Illinois.

TABLE X.—*Annual and average yields of four early yellow and six other varieties of oats grown at the Illinois Agricultural Experiment Station (at Urbana) in one or more of the 11 years, 1905 and 1907 to 1916, inclusive.*

[Data compiled from Illinois Agricultural Experiment Station Bulletin 195 (7).]

Group and variety.	Yield per acre (bushels).													
												Average.		
	1905	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1905 and 1907 to 1916	1913 to 1916	1915 and 1916
Early yellow:														
Sixty-Day	56.9	67.1	48.8	46.6	75.6	49.1	72.4	28.4	51.0	83.6	59.2	58.1	55.6	71.4
Kherson	.....	.....	.....	.....	.....	.....	.....	32.3	41.3	66.9	65.4	.....	51.5	66.2
Richland (Iowa No. 105)	.....	.....	.....	.....	.....	.....	.....	.....	.....	70.4	67.5	.....	.....	69.0
Albion (Iowa No. 103, white)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	76.4	.....	.....	.....
Early white:														
Early Champion	.....	.....	.....	.....	.....	.....	.....	24.3	41.6	66.6	57.8	.....	47.6	62.2
Midseason white:														
Siberian	68.2	33.7	31.7	43.6	58.6	60.5	72.8	24.3	50.4	62.3	71.4	52.5	52.1	66.9
American Banner	56.7	34.7	25.3	46.6	56.2	48.5	63.7	32.8	54.2	65.9	70.5	50.5	55.9	68.2
Swedish Select	.....	.....	.....	.....	.....	58.3	70.8	14.1	54.5	61.6	68.5	.....	49.7	65.1
Late white (side):														
Silver Plume	.....	.....	.....	.....	.....	.....	79.8	20.8	53.2	67.5	64.2	.....	51.4	65.9
Late black (side):														
Black Tartarian	.....	30.9	16.9	43.7	.....	.....	.....	.....	.....	60.3	52.9	.....	.....	56.6

RESULTS AT FAIRFIELD.

The annual and average yields of one representative each of the early yellow, early white, midseason white, and early red groups, respectively, grown by the Illinois Agricultural Experiment Station at Fairfield in 1909 and 1915, are given in Table XI, together with the yield of the Richland in 1915.

TABLE XI.—*Annual and average yields of the Sixty-Day, Richland, and three other varieties of oats grown by the Illinois Agricultural Experiment Station (at Fairfield) in the years 1909 and 1915.*

[Data compiled from Illinois Agricultural Experiment Station Bulletin 195 (7).]

Group and variety.	Yield per acre (bushels).			Group and variety.	Yield per acre (bushels).		
	1909	1915	Average.		1909	1915	Average.
Early yellow:				Early red:			
Sixty-Day	50.1	24.5	37.3	Red Rustproof (Texas Red)	60.1	34.1	47.1
Richland (Iowa No. 105)	.....	30.6	.....	Midseason white:			
Early white:				White Bonanza	35.4	34.5	35.0
Early Champion	48.9	27.3	38.1				

The few data given in Table XI show that the early red variety Red Rustproof (Texas Red), outyielded all others in the 2-year test at Fairfield, where it exceeded the Sixty-Day by about 10 bushels in average yield.

Conclusions.

The average yield of the leading variety in each group at the stations included in the east North-Central States is shown graphically in figure 4.

The data presented in Table VI indicate that under Ohio conditions early oats will yield about as well as the best midseason white varieties, such as Siberian, Big Four, Improved American, and Silvermine, and that where early maturity is an advantage they are preferable to these varieties. The late white side varieties are not to be recommended.

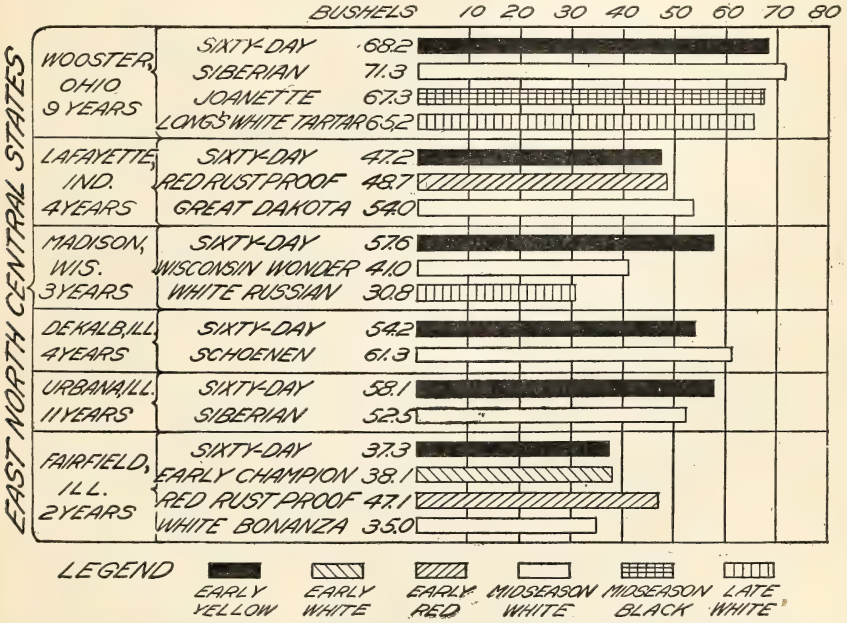

FIG. 4.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at six agricultural experiment stations in the east North-Central States, during the periods of years indicated.

The results obtained at La Fayette, Ind., show that the Kherson and the Sixty-Day are not desirable for growing in that State. The midseason white varieties apparently are the best under Indiana conditions. The midseason varieties are preferable to the early yellow varieties, Kherson and Sixty-Day, for the greater portion of Michigan.

The available Wisconsin data happen to include results for two years which were particularly unfavorable to midseason and late oats. They serve to show, however, that early oats are well worth growing on a part of the acreage in that State, particularly in the southern half.

Conditions in northern Illinois (De Kalb) are quite similar to those at Madison, Wis., but the data include those for several years favorable to midseason varieties, so that on the average these have outyielded the Sixty-Day. The yields of the Sixty-Day in the less favorable years with correspondingly higher prices, and particularly the high yields of the two Kherson selections from Iowa, indicate that early oats are desirable in this section.

In central Illinois the Sixty-Day has considerably outyielded the midseason and late varieties in an 11-year test and can be strongly recommended. In southern Illinois, as indicated by the test at Fairfield, the Red Rustproof is to be preferred.

RESULTS IN THE WEST NORTH-CENTRAL SECTION.

The west north-central section includes the States of Minnesota, Iowa, and Missouri, and the eastern and more humid portions of the Dakotas, Nebraska, and Kansas. Varietal experiments including Kherson and Sixty-Day oats have been conducted in all these States either independently by the State agricultural experiment stations or in cooperation with the United States Department of Agriculture.

The Minnesota station has grown the Kherson and Sixty-Day oats since 1906, but has not published the results of its experiments since 1908. The Northwest Experiment Station at Crookston, however, has recently reported the results of varietal trials, including these varieties, during the five years from 1912 to 1916. The North-Central Experiment Station at Grand Rapids also has reported the results of varietal experiments with Kherson and Sixty-Day oats for 1915 and 1916. The data available from eastern North Dakota are for the years from 1901 to 1908, and from South Dakota for the years from 1904 to 1917. Results are available from the Iowa station for the 11 years from 1907 to 1917, inclusive. Nebraska has recently published data on varietal experiments with oats, so that figures are available for the 14 years from 1903 to 1916. The Kansas station has published results obtained during the 7-year period from 1903 to 1909. The data since 1910 have been obtained in cooperation with the United States Department of Agriculture. No reports of varietal trials of oats at the Missouri station have been published for many years.

Results in Minnesota.

RESULTS AT UNIVERSITY FARM.

The annual and average yields of the Kherson, Sixty-Day, and six other commercial varieties of oats grown at the Minnesota Agricultural Experiment Station, University Farm, St. Paul (5), during the 3-year period 1906 to 1908, inclusive, are presented in Table XII.

The few data given in Table XII are not very conclusive. The Sixty-Day variety apparently has decidedly outyielded the Kherson, but the difference is due to an unexplained wide variation in yields in 1906. The best midseason white varieties, Myrick Banner and Lincoln, have yielded slightly less than the Sixty-Day. Typical panicles and spikelets of three leading midseason white varieties of oats are shown in figure 5.

FIG. 5.—Panicles and spikelets of three midseason white varieties of oats: 1, Victory; 2, Silvermine; 3, Swedish Select.

In a letter dated December 20, 1917, Prof. A. C. Arny, agronomist of the Minnesota station, states that in an experiment with heavy, medium, and light seed in which Ligowo and Sixty-Day (Minn. No. 261) were used, the Sixty-Day consistently outyielded the Ligowo in all cases in 1914, 1915, and 1916, but that the yields were reversed in 1917. He further states that the Victory oat has been the leading variety at the Minnesota station in recent years, and that a selection

from Sixty-Day has ranked second to Victory for three years. In his opinion early oats of the Sixty-Day type are promising in southern Minnesota.

TABLE XII.—*Annual and average yields of the Kherson, Sixty-Day, and six other varieties of oats grown at the Minnesota Agricultural Experiment Station (at St. Paul) during the 3-year period from 1906 to 1908, inclusive.*

[Data compiled from Minnesota Agricultural Experiment Station Bulletin 115 (5).]

Group and variety.	Minnesota No.	Yield per acre (bushels).			
		1906	1907	1908	Average.
Early yellow:					
Sixty-Day	261	76.8	62.5	44.0	61.1
Kherson	358	36.2	77.5	42.0	51.9
Early white:					
Early Champion	267	63.7	65.6	.....	.....
Midseason white:					
Myrick Banner	348	89.3	46.8	45.3	60.5
American Banner	311	88.1	36.9	40.7	55.2
Big Four	353	71.8	50.6	32.5	51.6
Lincoln	282	76.8	48.1	49.0	58.0
Late white (side):					
White Russian	302	85.0	38.7	33.5	52.4

RESULTS AT CROOKSTON.

The University of Minnesota Department of Agriculture has included the Kherson and Sixty-Day oats in the varietal experiments at the Northwest Experiment Station at Crookston since 1912. The data from these experiments have been published for the five years from 1912 to 1916, inclusive (34, pp. 38-40). The annual and average yields of the most important varieties are shown in Table XIII.

TABLE XIII.—*Annual and average yields of three strains of early yellow and twelve other varieties of oats grown at the Northwest Experiment Station, Crookston, Minn., during three or more years in the 5-year period from 1912 to 1916, inclusive.*

[Data compiled from Report of the Superintendent, Northwest Experiment Station, 1910–1916 (34, pp. 38–40).]

Group and variety.	Yield per acre (bushels).					
	1912	1913	1914	1915	1916	Average.
Early yellow:						
Sixty-Day	60.2	60.5	46.3	63.4	35.5	53.2
Do	.....	32.1	32.2	47.2	.....	.....
Kherson	40.1	39.5	47.7	65.4	34.2	45.4
Early white:						
Early Champion	45.1	31.8	46.3	42.9	27.6	38.7
Midseason yellow:						
Golden Beauty	62.0	57.0	47.5	99.6	21.7	55.6
Midseason white:						
King Oscar	58.1	53.2	60.6	89.2	26.1	57.4
Banner	81.8	56.8	45.0	72.8	28.6	57.0
Improved American	59.3	59.0	50.9	91.7	22.2	56.6
Canadian, No. 429	68.0	59.5	44.1	89.6	20.4	56.3
Victory	51.3	54.5	56.9	85.6	30.2	55.7
Danish Island	34.3	73.7	60.1	79.8	24.5	54.5
Lincoln, No. 282	50.3	47.4	55.0	94.2	23.3	54.0
Swedish Select	64.1	51.3	47.2	76.3	24.5	52.7
Late white (side):						
Canadian Cluster	55.1	55.7	41.3	86.5	20.0	51.7
White Russian	60.1	43.1	48.4	88.8	23.6	52.8

The data contained in Table XIII show that on the average the midseason white varieties have slightly outyielded the Sixty-Day in northwestern Minnesota, the better varieties averaging about 4 bushels more in the 5-year period from 1912 to 1916. In occasional unfavorable years, as in 1916, the early oats considerably outyielded the midseason varieties. The 5-year average yields of the Sixty-Day and the White Russian, a late side oat popular in this section, were practically the same. The Sixty-Day averaged about 8 bushels more than the Kherson for the 5-year period, but the difference is due entirely to wide variations in the yields in 1912 and 1913.

RESULTS AT GRAND RAPIDS.

The University of Minnesota Department of Agriculture has included the Kherson and Sixty-Day oats in the varietal experiments conducted at the North-Central Experiment Station at Grand Rapids (26, p. 16). The results of these experiments are reported for the years 1915 and 1916. The annual and average yields of the Sixty-Day and Kherson and a number of other varieties are shown in Table XIV.

TABLE XIV.—*Annual and average yields of the Kherson, the Sixty-Day, and eight other varieties of oats grown at the North-Central Experiment Station, Grand Rapids, Minn., in 1915 and 1916.*

[Data compiled from Report of Progress of Work and Guide to Experimental Plats, North-Central Experiment Station, Minnesota Agricultural Experiment Station, 1917 (26, p. 16).]

Group and variety.	Yield per acre (bushels).			Group and variety.	Yield per acre (bushels).		
	1915	1916	Average.		1915	1916	Average.
Early yellow:				Midseason white—Continued.			
Kherson	106.3	61.9	84.1	Lincoln (pedigreed)	95.6	46.6	71.1
Sixty-Day	110.6	40.0	75.3	Danish Island	84.4	56.9	70.7
Midseason yellow:				Abundance	83.9	52.2	68.1
Golden Beauty	86.8	57.5	72.2	Swedish Select	79.6	50.6	65.1
Midseason white:				Late white (side):			
Banner	97.9	61.2	79.6	White Russian	100.0	57.8	78.9
Newmarket	88.6	57.5	73.1				

The data presented in Table XIV show that in 1915 the Kherson and Sixty-Day decidedly outyielded all other varieties at Grand Rapids. In 1916 occurred an unexplained wide difference in yield between them, the Kherson being the highest yielding and the Sixty-Day the lowest of the 12 varieties included in the tests. Evidently the Sixty-Day was grown under very unfavorable conditions or some discrepancy occurred in the experiments which resulted in the abnormally low yield. The average yield of the Kherson for the two years is 4.5 bushels higher than that of any other variety.

Results in Eastern North Dakota (35).[1]

The annual and average yields of the two early yellow varieties, Sixty-Day and Seventy-five Day, and of eight other varieties of oats grown at the North Dakota Agricultural Experiment Station at Fargo during six or more years of the 8-year period from 1901 to 1908, inclusive, are shown in Table XV. These results were obtained in cooperation with the Office of Cereal Investigations.

TABLE XV.—*Annual and average yields of two early yellow and eight other varieties of oats grown at the North Dakota Agricultural Experiment Station (at Fargo) during six or more years in the 8-year period from 1901 to 1908, inclusive.*

[Data obtained cooperatively by the North Dakota Agricultural Experiment Station and the Bureau of Plant Industry.]

Group and variety.	North Dakota No.	Yield per acre (bushels).							Average.	
		1901	1902	1903	1904	1906	1907	1908	1901 to 1904 and 1906 to 1908	1902 to 1904 and 1906 to 1908
Early yellow:										
Sixty-Day	666	50.4	72.2	42.0	59.2	47.9	77.5	95.2	63.5	65.7
Seventy-five Day[1]	617	.....	96.9	50.7	75.4	54.2	76.5	91.5	.....	74.2
Midseason white:										
Big Four	725	58.8	41.6	70.5	54.9	58.1	60.0	75.0	59.8	60.0
Abundance	866	58.9	47.5	71.2	67.3	50.0	54.2	66.5	59.4	59.5
Siberian	864	60.5	47.0	69.1	55.5	47.9	55.5	80.0	59.4	59.2
Lincoln	768	54.5	33.9	66.1	65.5	43.7	55.0	95.0	59.1	59.9
Swedish Select	1139	.....	30.8	68.2	54.6	48.1	58.7	67.0	.....	54.6
Late white (side):										
Tartarian[2]	388	43.9	63.9	77.3	58.7	55.6	51.0	75.0	60.8	63.6
New Zealand	868	49.9	49.3	66.3	65.9	52.5	44.0	82.5	58.6	60.1
White Russian	238	.....	55.8	74.9	59.0	55.5	35.2	84.0	.....	60.7

[1] S. P. I. No. 5168, similar to Sixty-Day. [2] Probably the same as White Russian.

The data in Table XV show that the early yellow varieties of the Sixty-Day group considerably outyielded all others at Fargo in the seven years for which data are available, the Sixty-Day exceeding the Big Four, the best of the midseason varieties, by 3.7 bushels, and the Tartarian, a late side oat, by 2.7 bushels. While these differences are not large enough to be regarded as significant, the yields indicate that in this section of the Red River Valley the early oats are at least as good as the midseason and late varieties. The so-called "Seventy-five Day" oat, an earlier importation from Russia, probably identical with the Sixty-Day, has outyielded the latter at Fargo by 8.5 bushels in a 6-year period.

Under date of December 7, 1917, Prof. R. C. Doneghue, agronomist of the North Dakota station, writes:

> It is my opinion, based on the trials here at Fargo, that the Sixty-Day oats are very well suited to the Red River Valley. They stand up very well, yield well and will

[1] Data for 1907 and 1908, from unpublished annual reports of Prof. J. H. Shepperd and Mr. O. O. Churchill, formerly collaborator and special agent, respectively, filed in the Office of Cereal Investigations.

give fairly good results in quite a wide range of seasons. I consider them one of the best varieties for this region. From the standpoint of distributing the harvest season over a longer period it might be wise to grow some of the midseason varieties as well as the Sixty-Day oats on the farms of the Red River Valley, but I think that Sixty-Day or Kherson can be grown on a very large percentage of the farms with profit.

Results in Eastern South Dakota.[1]

The annual and average yields of the Sixty-Day and six other varieties of oats grown by the South Dakota Agricultural Experiment Station in cooperation with the United States Department of Agriculture at Brookings are given in Table XVI. Data are available for the 14 years from 1904 to 1917, inclusive.

TABLE XVI.—*Annual and average yields of the Sixty-Day and six other varieties of oats grown at the South Dakota Agricultural Experiment Station (at Brookings) during seven or more years in the 14-year period from 1904 to 1917, inclusive.*

[Data obtained in cooperation with the South Dakota Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).														
		1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Average, 1904 to 1913
Early yellow:																
Sixty-Day	165	69.6	80.0	61.6	24.4	59.2	46.7	28.7	19.4	64.0	90.0	51.6	84.3	73.0	60.2	54.4
Midseason white:																
Swedish Select	134	70.0	45.3	61.6	24.1	25.0	44.0	29.0	4.7	86.0	91.9	42.4	48.4	37.0	51.6	48.2
Belyak	336	[1]28.0	37.5	42.8	9.1	26.8	28.9	27.8	2.0	86.5	97.5	40.6	(2)	....	....	38.7
Banner	160	54.7	35.2	42.7	8.1	2.5	22.2	30.0	3.6	98.1	99.4	46.9	(2)	....	....	39.7
Midseason black:																
North Finnish Black	174	65.0	35.7	40.8	5.9	20.6	28.6	28.4	10.9	73.1	71.5	....	....	....	....	38.0
Late white (side):																
Wideawake[3]	154	51.7	24.1	35.0	11.9	12.5	29.7	25.3	0.9	....	94.0	56.2	(2)	....	....	.....
White Tartar	445	....	41.9	32.3	6.3	10.4	25.8	26.6	1.9	....	....	....	....	....	....	.....

[1] Not comparable; grown under unfavorable conditions. [2] Destroyed by hail.
[3] The variety is incorrectly named, as the true Wideawake is not a side oat.

The data presented in Table XVI show that the early yellow variety Sixty-Day has outclassed all other varieties at Brookings. Its nearest competitor has been the Swedish Select, but the 14-year average yield of this variety has fallen 10 bushels below that of the Sixty-Day, the average yields being 58.1 and 47.9 bushels, respectively. The Banner, a popular old variety, has been exceeded in yield by the Sixty-Day in seven of the eleven years in which both were grown. In seven years (1905–1911) the average yield of the Sixty-Day (45.7 bushels) was more than double that of the White Tartar (20.7 bushels), a late side oat.

[1] Data obtained cooperatively by the South Dakota station and the Bureau of Plant Industry. The data previous to 1912 were published by the United States Department of Agriculture (10).

Results in Iowa.[1]

The annual and average yields of five strains of early yellow and thirteen other varieties of oats grown at the Iowa Agricultural Experiment Station at Ames in cooperation with the United States Department of Agriculture during three or more years in the 11-year period from 1907 to 1917, inclusive, are presented in Table XVII.

FIG. 6.—Panicle and spikelets of an early white variety of oats, Early Champion.

The data presented in Table XVII indicate that the early yellow varieties, Kherson, Sixty-Day, and selections from them, are the most dependable for Iowa conditions. The average yield of the original Kherson in the 11-year period from 1907 to 1917, inclusive, is 52.9 bushels, as compared with similar averages of 52.4 and 52.2 bushels for Myrick and Silvermine, respectively, the two highest yielding midseason varieties. However, since 1911 Richland, a selection from Kherson, has consistently outyielded all others. In the 7-year period from 1911 to 1916, inclusive, this selection has exceeded the original Kherson by 4.8 bushels, and the Silvermine, its nearest competitor of the midseason varieties, by 2.9 bushels in average yield per acre. Albion, a white selection from Kherson, has not been as promising at Ames under central Iowa conditions, but is much more popular with farmers. A panicle and spikelets of Early Champion, an early white oat, are shown in figure 6.

[1] Data obtained cooperatively by the Iowa Agricultural Experiment Station and the Bureau of Plant Industry. Data for 1907 published in Iowa Agr. Exp. Sta. Bul. 96, entitled "Oats, Varieties, Seed, Smut, Seedbed, Seeding," by M. L. Bowman and L. C. Burnett, 1908; for 1908 to 1910, inclusive, published in Iowa Agr. Exp. Sta. Bul. 128, entitled "Some Data for Oat Growers," by L. C. Burnett, 1912; for 1911 and succeeding years, compiled from unpublished annual reports of L. C. Burnett, agent, to the Office of Cereal Investigations.

TABLE XVII.—*Annual and average yields of the Kherson, the Albion, the Richland, two strains of the Sixty-Day, and thirteen other varieties of oats grown at the Iowa Agricultural Experiment Station (at Ames) during three or more years in the 11-year period from 1907 to 1917, inclusive.*

[Data obtained in cooperation with the Iowa Agricultural Experiment Station.]

Group and variety.	Yield per acre (bushels).												
												Average.	
	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1907 to 1917	1911 to 1917
Early yellow:													
Kherson	45.6	48.8	35.3	62.2	38.1	65.6	62.8	55.3	49.1	53.8	65.0	52.9	55.7
Albion (Iowa No. 103, white)	.....	.....	.....	.....	40.6	53.7	63.7	55.6	41.6	46.1	73.7	.....	53.6
Richland (Iowa No. 105)	.....	.....	.....	.....	44.8	83.7	55.6	62.8	59.3	53.6	63.7	.....	60.5
Sixty-Day	.....	50.0	31.2	67.8	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do	.....	45.2	50.0	57.8	.....	.....	.....	.....	.....	.....	.....	.....	.....
Early white:													
Early Champion	29.3	37.5	24.7	61.9	35.0	48.1	50.6	48.4	42.2	48.7	68.1	45.0	48.7
Daubeney	.....	.....	38.1	55.7	31.0	71.2	50.3	48.1	50.9	52.4	81.9	.....	55.1
Early red:													
Burt	.....	.....	.....	43.8	40.6	60.6	52.1	45.6	54.7	55.3	79.4	.....	55.5
Red Rustproof (Texas Red)	35.8	41.9	32.8	66.6	5.9	68.7	49.1	44.7	54.4	51.2	66.2	47.0	48.6
Midseason yellow:													
Probsteier	19.3	28.1	27.5	61.9	25.5	56.9	51.2	40.3	53.1	51.5	65.6	43.7	49.2
Midseason white:													
Myrick	26.2	38.1	32.5	91.9	81.1	91.9	57.5	44.1	61.8	37.7	63.1	52.4	55.3
Silvermine	31.5	36.6	31.6	70.6	36.3	81.9	60.3	46.8	55.2	51.7	71.2	52.2	57.6
Green Russian	36.2	39.4	33.4	64.1	31.8	83.7	53.4	45.7	57.6	53.6	50.0	49.9	53.7
Irish Victor	28.0	33.8	33.4	66.2	37.4	79.4	57.2	43.8	54.3	46.7	65.6	49.6	54.9
Early Gothland	25.0	33.7	35.9	70.6	23.6	80.0	62.8	43.1	60.7	50.0	53.7	49.0	53.4
Siberian	29.2	36.6	31.9	59.4	20.5	88.1	59.4	40.0	59.8	52.1	53.7	48.2	53.4
Swedish Select	32.0	31.0	33.1	62.2	25.5	75.0	50.6	37.6	44.8	43.0	63.7	45.3	48.6
Midseason black:													
Joanette	35.6	28.4	33.1	60.3	23.9	88.7	50.2	43.7	60.6	52.6	66.9	49.5	55.2
Late white (side):													
White Russian	27.1	25.6	45.6	60.0	19.8	83.1	46.6	44.4	52.3	41.4	35.0	43.7	46.1

Results in Nebraska.

The annual and average yields of the Kherson, the Sixty-Day, and seven other varieties of oats grown at the Nebraska Agricultural Experiment Station at Lincoln (21 and 27) during six or more years in the 14-year period from 1903 to 1916, inclusive, are given in Table XVIII.

The data in Table XVIII show that the early red varieties have decidedly outyielded both the early yellow and midseason white varieties at Lincoln. In the 12-year period from 1905 to 1916, inclusive, the Kherson has fallen 7.4 bushels below the Burt and 5.8 bushels below the Red Rustproof (Texas Red) in average yield per acre. In this period the Swedish Select has yielded 3.5 bushels less than the Kherson and 10.9 bushels less than the Burt. The data show conclusively that the Kherson is better than the midseason varieties in eastern Nebraska where the conditions are similar to those at Lincoln, but that the Red Rustproof and Burt are superior to it.

TABLE XVIII.—*Annual and average yields of the Kherson, the Sixty-Day, and seven other varieties of oats grown at the Nebraska Agricultural Experiment Station (at Lincoln) during six or more years in the 14-year period from 1903 to 1916, inclusive.*

[Data compiled from Nebraska Agricultural Experiment Station Bulletin No. 160 (21).]

Group and variety.	Yield per acre (bushels).																	
																Average.		
	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1903 to 1916	1905 to 1916	1911 to 1916
Early yellow:																		
Kherson	68.0	55.1	82.7	36.4	49.0	54.0	67.2	41.7	38.5	37.4	44.8	69.7	40.1	85.4	55.0	53.9	52.7
Sixty-Day	52.4	51.8	84.2	40.7	59.6	....	60.3	....	....	....	....	....	....	....	....	....	....
Early red:																		
Red Rustproof (Texas Red)	57.5	40.6	81.7	44.1	42.5	65.0	77.6	53.1	42.5	35.6	60.3	71.3	56.0	87.1	58.2	59.7	58.8
Burt	....	....	85.5	42.3	48.5	64.3	74.1	60.7	38.2	38.6	61.4	76.7	65.9	79.2	....	61.3	60.0
Burt (June)	....	....	....	....	....	....	....	....	32.0	33.9	53.3	63.9	54.9	85.5	....	....	53.9
Midseason white:																		
Swedish Select	31.5	24.5	69.2	42.8	32.5	44.0	67.1	55.8	41.2	26.4	45.9	60.7	35.2	83.6	47.2	50.4	48.8
American Banner	45.6	31.8	76.3	40.2	31.0	34.3	61.7	51.9	35.7	28.0	33.9	47.1	34.5	67.5	44.3	45.2	41.1
Lincoln	....	22.8	85.2	42.3	28.5	43.6	71.6	51.8	39.1	29.5	40.3	53.5	30.7	70.3	....	48.9	43.9
University No. 6 (Improved Ligowo)	....	31.5	77.1	34.6	29.4	49.0	68.0	45.2	32.6	25.9	22.0	49.1	31.0	66.3	....	44.2	37.8

Results in Eastern Kansas.

The annual and average yields of seven early yellow and five other varieties of oats grown at the Kansas Agricultural Experiment Station at Manhattan during five or more years in the 10-year period from 1908 to 1917, inclusive, are shown in Table XIX.

TABLE XIX.—*Annual and average yields of seven early yellow and five other varieties of oats grown at the Kansas Agricultural Experiment Station (at Manhattan) during five or more years in the 10-year period from 1908 to 1917, inclusive.*[1]

[Data obtained in cooperation with the Kansas Agricultural Experiment Station.]

Group and variety.	Kansas No.	Yield per acre (bushels).												
												Average.		
		1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1908 to 1917	1908 and 1909, 1911 to 1917.	1911 to 1917
Early yellow:														
Kherson	5034	28.1	60.5	55.4	18.0	45.5	13.2	27.1	40.2	50.8	47.8	38.7	36.8	34.7
Do	6021	....	....	48.5	18.2	41.3	16.9	34.5	45.0	51.7	50.6	....	....	36.9
Sixty-Day (Sel. 5009)	6014	....	....	....	17.9	49.7	5.8	24.2	42.2	....	....	....	....	....
Sixty-Day (Kans.)	5009	23.6	69.7	54.5	14.4	52.6	11.7	29.1	37.8	51.9	51.7	39.7	38.1	35.6
Sixty-Day (Ind.)[2]	5043	....	85.8	62.8	18.2	54.3	10.4	26.2	27.5	47.9	....	....	....	....
Sixty-Day (N. Dak.)[2]	5044	....	88.5	59.3	15.7	45.4	11.2	31.9	23.1	48.3	....	....	....	....
Seventy-five Day	5104	....	58.9	....	23.9	42.2	13.7	30.7	40.4	....	....	....	....	....
Early red:														
Burt (C. I. No. 293)	5020	41.9	64.9	....	18.0	45.3	12.9	32.7	46.3	56.1	61.5	....	42.2	39.0
Red Rustproof (Texas Red)	5031	45.8	43.0	....	17.2	63.2	10.4	18.1	33.9	42.0	49.5	....	35.9	33.5
Do	5015	37.5	63.7	....	14.1	56.8	16.1	40.3	38.4	53.5	57.6	....	42.0	39.5
Red Algerian	5105	....	56.2	....	17.7	59.6	18.3	34.7	38.7	60.6	56.6	....	....	40.9
Midseason white:														
Green Russian	5122	....	....	57.5	16.4	57.1	6.3	32.6	37.3	44.4	52.7	....	....	35.3

[1] Data from unpublished annual reports of Prof. W. M. Jardine, formerly collaborator, to the Office of Cereal Investigations.

[2] Data from trilocal experiments.

The data in Table XIX show that for eastern Kansas the Kherson and Sixty-Day are close competitors of the Burt, Red Rustproof, and other early red varieties. In the nine years, 1908, 1909, and 1911 to 1917, inclusive, the average yield of the Sixty-Day was 38.1 bushels and that of the Burt 42.2 bushels. In the 7-year period from 1911 to 1917, inclusive, the Kherson strain, Kansas No. 6021, has fallen about 4 bushels below the Red Algerian, but has outyielded the Green Russian, the only midseason white variety included in the tests, by about 1.5 bushels.

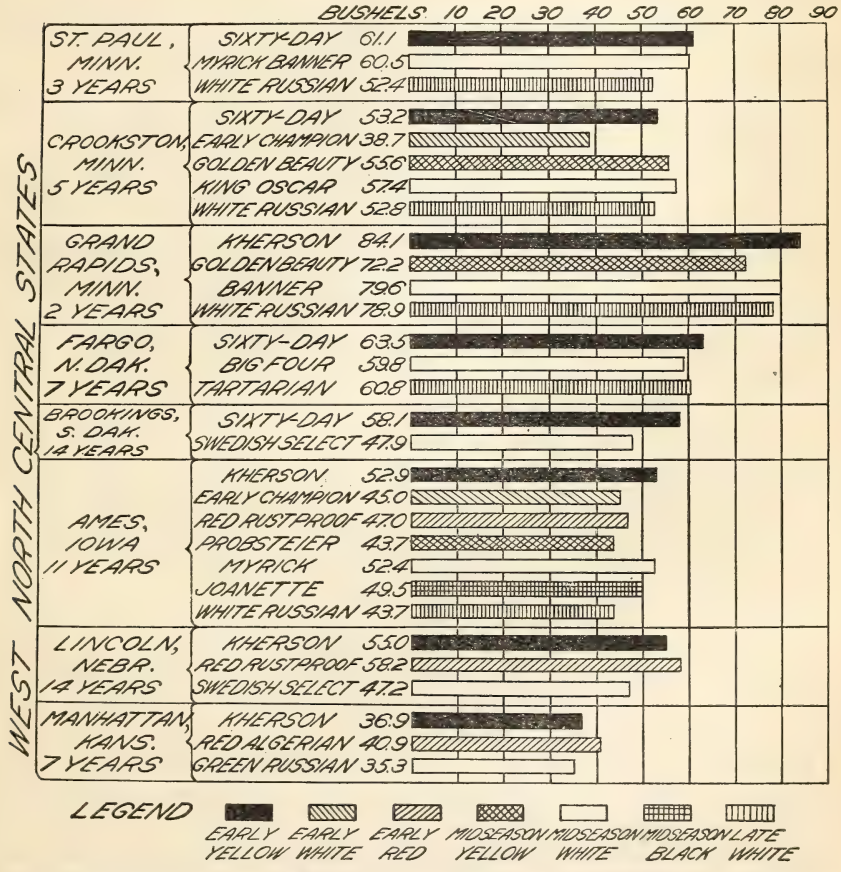

FIG. 7.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at eight experiment stations in the west north-central section during the periods of years indicated.

Conclusions.

The average yield of the leading variety in each group at the stations included in the west north-central section is shown graphically in figure 7.

In general, Kherson and Sixty-Day oats have yielded as well as or slightly better than other varieties in this section.

At the agricultural experiment station at St. Paul, in eastern Minnesota, early varieties have yielded equally as well as the best midseason varieties. At the Crookston substation in northwestern Minnesota the midseason varieties have outyielded the early varieties, Kherson and Sixty-Day. White Russian, a late side oat, popular in this section, however, has not exceeded the early varieties in average yield at this station. Two years' results at the Grand Rapids substation in north-central Minnesota favor the early varieties, but additional data are necessary before more definite conclusions can be drawn.

Early varieties of the Sixty-Day type have slightly exceeded the leading midseason varieties in average yield per acre at the agricultural experiment station at Fargo in the Red River valley in southeastern North Dakota.

At the agricultural experiment station at Brookings, in eastern South Dakota, Sixty-Day oats have decidedly outyielded all others and are to be strongly recommended.

At the agricultural experiment station at Ames, in central Iowa, early varieties of the Kherson or Sixty-Day type have yielded better than the best midseason varieties. During the past seven years Richland, a short-strawed yellow oat, selected from Kherson, has consistently outyielded all others. Albion (Iowa No. 103), a white selection from the Kherson, is very popular in the State.

At the agricultural experiment stations at Lincoln, Nebr., and Manhattan, Kans., the early red varieties, Burt and Red Rustproof, have yielded considerably better than the Kherson and Sixty-Day. The early yellow varieties have outyielded the midseason varieties and are the next best to grow in eastern Nebraska and Kansas.

RESULTS IN THE LOWER MISSISSIPPI VALLEY.

The section here designated as the lower Mississippi Valley includes Kentucky, Tennessee, Mississippi, Louisiana, Arkansas, southern Missouri, southeastern Kansas, and the eastern or more humid portions of Oklahoma and Texas.

The spring oat crop in this section of the United States is not an important one, and consequently very little experimental work has been done with it. The State agricultural experiment stations of Tennessee, Arkansas, and Missouri have reported some varietal experiments with Kherson and Sixty-Day oats. In some cases, comparisons have been made with fall-sown varieties.

The Tennessee Agricultural Experiment Station at Knoxville grew the Kherson variety during the five years from 1908 to 1912, inclusive, in comparison with winter oats as well as with other spring varieties. During the four years, 1910 to 1913, inclusive, the Missouri Agricultural Experiment Station grew the Kherson and a number of other varieties near Carthage (Jasper County), in southwestern Missouri.

Varietal experiments including the Sixty-Day oat were conducted by the Arkansas station at Fayetteville during the 5-year period from 1909 to 1913, inclusive.

During the six years from 1904 to 1909, inclusive, the United States Department of Agriculture, in cooperation with the Kansas Agricultural Experiment Station, conducted varietal experiments with oats at McPherson, Kans. Several early yellow varieties were included in these experiments. No results of varietal experiments with oats have been published by the Oklahoma station. Three years' results of varietal experiments with oats have been reported by the Denton (Tex.) substation.

Results in Tennessee.

The annual and average yields of the Kherson and three other varieties of oats grown at the Tennessee Agricultural Experiment Station (28) during two or more years in the 5-year period from 1908 to 1912, inclusive, are presented in Table XX.

TABLE XX.—*Annual and average yields of the Kherson and three other varieties of oats grown at the Tennessee Agricultural Experiment Station (at Knoxville) during two or more years in the 5-year period from 1908 to 1912, inclusive.*

[Data compiled from Tennessee Agricultural Experiment Station Bulletin 112 (28).]

Group and variety.	Yield per acre (bushels).						
	1908	1909	1910	1911	1912	Average. 1911 and 1912	Average. 1908 to 1912
Early yellow:							
Kherson	29.5	26.4	43.2	12.6	44.3	28.5	31.2
Early red:							
Burt	27.3	20.2	45.6	14.9	47.7	31.3	31.1
Red Rustproof[1]	20.7	23.3	32.7	12.8	45.2	29.0	26.9
Winter:							
Culberson	.....	.....	.....	21.1	50.8	36.0	.....

[1] This variety is grown from both spring and fall seeding in the South.

Table XX shows that in the 5-year period from 1908 to 1912, inclusive, the Kherson outyielded both the Burt and the Red Rustproof, though exceeding the Burt by only 0.1 bushel. However, in 1911 and 1912 the Culberson, a winter variety, decidedly outyielded all spring-sown oats. Additional data obtained with winter varieties in other years than those for which data are given in Table XX show that in general winter oats are superior to spring oats for growing in most sections of Tennessee.

Results in Southwestern Missouri.

The annual and average yields of the Kherson and five other varieties of oats grown near Carthage, Mo. (18), during the 4-year period from 1910 to 1913, inclusive, are shown in Table XXI.

TABLE XXI.—*Annual and average yields of the Kherson and five other varieties of oats grown near Carthage, Mo., by the Missouri Agricultural Experiment Station during the 4-year period from 1910 to 1913, inclusive.*

[Compiled from Missouri Agricultural Experiment Station Bulletin 123 (18).]

Group and variety.	Yield per acre (bushels).				
	1910	1911	1912	1913	Average.
Early yellow:					
Kherson	55.5	11.3	14.8	15.9	24.4
Early red:					
Red Rustproof (Texas Red)	57.5	11.3	17.5	11.7	24.5
Midseason white:					
Swedish Select	59.0	5.6	16.6	8.0	22.3
Lincoln	66.8	7.0	11.3	9.0	23.5
Midseason black:					
Victor	52.6	8.4	11.9	7.7	20.2
Late white (side):					
White Tartar	64.8	8.4	20.8	6.9	25.2

The data shown in Table XXI are not conclusive. Though the Kherson has yielded as well as any other variety at Carthage, more data are needed before the most desirable varieties for growing in southwestern Missouri can be named definitely.

Results in Arkansas.

The annual and average yields of the Kherson, the Sixty-Day, and six other varieties of oats grown at the Arkansas Agricultural Experiment Station at Fayetteville (30) in the five years from 1909 to 1913, inclusive, are presented in Table XXII.

TABLE XXII.—*Annual and average yields of the Kherson, the Sixty-Day, and six other varieties of oats grown at the Arkansas Agricultural Experiment Station (at Fayetteville) during the 5-year period from 1909 to 1913, inclusive.*

[Data compiled from Arkansas Agricultural Experiment Station Bulletin 118 (30).]

Group and variety.	Yield per acre (bushels).					
	1909	1910	1911	1912	1913	Average.
Early yellow:						
Kherson	21.7	60.0	28.1	17.3	29.5	31.3
Sixty-Day	29.3	47.0	26.2	18.5	30.0	30.2
Early white:						
Daubeney	31.8	60.5	25.7	15.7	35.6	33.9
Early Champion	29.3	56.0	38.4	15.0	29.5	33.6
Early red:						
Burt	19.5	63.5	37.9	22.0	38.9	36.4
Red Rustproof	26.8	72.8	26.0	24.6	22.4	34.5
Winter:						
Winter Turf (Winter Gray)	26.5	48.2	(1)	43.3	41.2	31.8
Winter Turf	32.2	54.0	(1)	43.5	38.2	33.6

[1] Winterkilled.

According to the data shown in Table XXII both the early red and the early white varieties have outyielded the Kherson and Sixty-Day at Fayetteville. The one best variety has been the Burt, which has outyielded the Kherson by slightly more than 5 bushels

on the average in the 5-year period from 1909 to 1913, inclusive. The Winter Turf from fall seeding also has exceeded the Kherson and Sixty-Day, even though one crop was entirely lost by winterkilling.

Results in Kansas.

The annual and average yields of the Sixty-Day, the Seventy-five Day, the Kherson, and seven other varieties of oats grown at McPherson, Kans. (12), in four or more years in the 6-year period from 1904 to 1909, inclusive, are shown in Table XXIII.

TABLE XXIII.—*Annual and average yields of the Sixty-Day, the Seventy-five Day, the Kherson, and seven other varieties of oats grown at McPherson, Kans., during four or more years in the 6-year period from 1904 to 1909, inclusive.*[1]

[Data obtained in cooperation with the Kansas Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).							
		1904	1905	1906	1907	1908	1909	Average.	
								1906 to 1909	1904 to 1909
Early yellow:									
Sixty-Day	165	44.9	33.8	43.5	4.7	49.1	53.0	37.6	38.2
Seventy-five Day [2]	337	.....	.....	[3] 51.2	4.9	39.5	50.8	36.5	.....
Kherson	459	.....	.....	([4])	6.7	41.2	49.9	.....	.....
Early white:									
Perm	170	.....	.....	50.2	6.3	37.7	43.1	34.3	.....
Early red:									
Red Algerian	286	29.4	[4] 30.7	42.0	5.3	37.1	44.5	32.2	31.5
Burt	293	40.7	27.5	42.2	3.4	34.1	38.3	29.5	31.0
Georgia Rustproof	261	.....	.....	50.5	8.1	31.6	48.1	34.6	.....
Midseason white:									
Canadian	444	.....	28.8	37.3	3.6	16.3	33.1	22.6	.....
Danish	441	.....	26.9	42.4	2.3	16.3	22.8	21.0	.....
Late white (side):									
White Tartar	445	.....	36.9	44.2	4.7	23.4	34.9	26.8	.....

[1] Data previously published in U. S. Dept. Agr., Bur. Plant Indus. Bul. 240 (12).
[2] Similar to Kherson and Sixty-Day.
[3] Yield corrected, or average of two or more plats.
[4] Yield not comparable.

The data in Table XXIII show that the early yellow varieties considerably outyielded all others at McPherson. Their nearest competitor was the Georgia Rustproof, a strain of Red Rustproof. The Perm, a slightly later oat from a more northerly district in Russia, averaged about 3 bushels less than the Sixty-Day. The Seventy-five Day, which, as previously noted, probably is identical with the Sixty-Day, averaged 1 bushel less in a 4-year test. The Sixty-Day exceeded the midseason and late oats by about 50 per cent.

Results in Northeastern Texas.

Varietal experiments with Sixty-Day and several other varieties of oats were conducted by the Texas Agricultural Experiment Station at the Denton substation, near Denton, Tex. (13, p. 9–10), during 1912, 1913, and 1914. The results of these experiments are summarized in Table XXIV.

The data in Table XXIV show that the Sixty-Day in the three years, 1912, 1913, and 1914, was outclassed only by the Red Rustproof, the standard oat variety for that section. The average yields were 38.4 and 41.4 bushels, respectively. The Burt also has been a close competitor of the Sixty-Day. It is believed that the early

FIG. 8.—Panicles and spikelets of two early red varieties of oats; 1, Red Rustproof; 2, Burt.

varieties, such as Sixty-Day and Burt, are particularly valuable for late seeding and dry seasons in the Denton district. Fall-sown Red Rustproof yielded about the same as it did from spring seeding. Typical panicles and spikelets of the Red Rustproof and Burt varieties are shown in figure 8.

TABLE XXIV.—*Annual and average yields of Sixty-Day and five other varieties of oats grown at Texas substation No. 6 (at Denton) in the years 1912, 1913, and 1914.*

[Data compiled from Texas Agricultural Experiment Station Bulletin No. 199 (13, p. 9–10).]

Group and variety.	Texas No.	Yield per acre (bushels).			
		1912	1913	1914	Average.
Early yellow:					
Sixty-Day	430	70.0	33.4	11.8	38.4
Early red:					
Red Rustproof	636	51.1	49.8	23.3	41.4
Burt	433	42.7	45.3	20.1	36.0
Ninety-Day	434	38.0	49.1	19.4	35.5
Red Siberian	432	38.8	34.4	24.7	32.6
Red Algerian	431	32.5	34.4	25.7	30.9

Conclusions.

The average yield of the leading variety in each group at the stations included in the lower Mississippi Valley is shown graphically in figure 9.

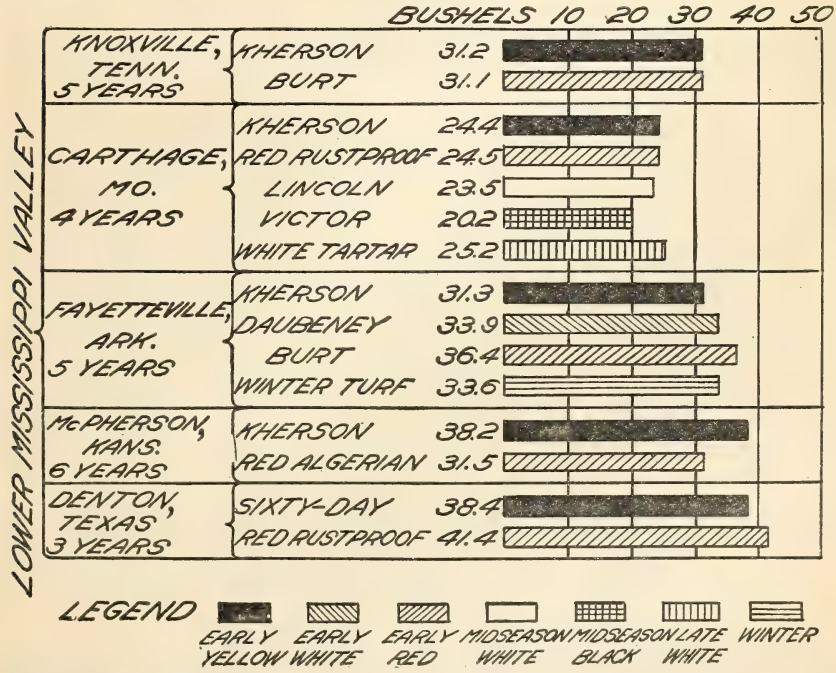

FIG. 9.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at five agricultural experiment stations in the lower Mississippi Valley during the periods of years indicated.

In general, oat growing, particularly from spring seeding, is not important in the lower Mississippi Valley. The best oat to sow in this section, whether in the fall or in the spring, is the Red Rustproof. The next best variety for spring seeding probably is the Burt, and next to this ranks the Sixty-Day, or Kherson. The Sixty-Day type is not extensively grown in this section, and comparatively few experiments including varieties of this type have been reported.

VARIETAL EXPERIMENTS IN THE WESTERN HALF OF THE UNITED STATES.

In recent years the Kherson and Sixty-Day oats have been included in numerous varietal experiments conducted in the western United States. Because of the rapid agricultural development which is now taking place in this region, there is a great demand for information on the different varieties of the more important grain crops. In consequence, rather extensive varietal experiments with oats have been conducted at numerous stations and the results reported from time to time. Results from 25 experiment stations and farms located in 12 States are presented in this bulletin.

This portion of the United States, including those States from which no experiments with oats have been reported, may be divided as follows: The northern Great Plains area, the southern Great Plains area, and the western Great Basin and coast areas. The few results available from experiments conducted under irrigation also are reported. The general physical data will be discussed separately for each of these three subdivisions.

The experiments at Hays, Kans.; Newell, Highmore, Cottonwood, and Eureka, S. Dak.; Williston and Dickinson, N. Dak.; Moccasin, Mont.; Nephi, Utah; Aberdeen, Idaho; and Burns and Moro, Oreg., have been conducted cooperatively by the United States Department of Agriculture and the State agricultural experiment stations of those States, respectively. At other stations the agencies cooperating with the United States Department of Agriculture have been as follows: Amarillo, Tex., Amarillo Chamber of Commerce; Akron, Colo., and Mandan, N. Dak., Office of Dry-Land Agriculture Investigations; Archer, Wyo., Wyoming Board of Farm Commissioners; and Chico, Calif., Office of Foreign Seed and Plant Introduction. The experiments at North Platte, Nebr.; Edgeley and Langdon, N. Dak.; Reno, Nev.; Bozeman, Mont.; Gooding, Idaho; Pullman and Puyallup, Wash., have been conducted independently by the respective State agricultural experiment stations.

RESULTS IN THE NORTHERN GREAT PLAINS AREA.

The Great Plains area comprises the great extent of gently sloping plain lying between the 98th meridian and the foothills of the Rocky Mountains. The northern Great Plains area includes the semiarid portions of Nebraska and the Dakotas west of the 98th meridian and also northeastern Colorado, eastern Wyoming, and eastern Montana.

Varietal experiments with the Kherson and Sixty-Day oats and a large number of other varieties have been conducted under dry-land conditions at 13 experiment stations in this section during periods varying from 2 to 12 years. The stations are as follows: Moccasin, Mont.; Williston, Dickinson, Mandan, Edgeley, and Langdon, N. Dak.;

Newell, Cottonwood, Eureka, and Highmore, S. Dak.; North Platte, Nebr.; Archer, Wyo.; and Akron, Colo.

The climate of this section is generally semiarid. It is characterized by low precipitation and high summer temperatures. Table XXV shows the altitude, the normal annual and seasonal precipitation, the mean temperatures for June, July, and August, and the general soil type at each of the 13 stations included in the section under consideration.

TABLE XXV.—*Altitude, average annual and seasonal precipitation, mean seasonal temperatures, and general soil types at 13 experiment stations in the northern Great Plains area.*

[The circled figures in columns 6, 7, and 8 indicate the number of years during which the data were recorded when such period was less than the number of years indicated in column 3.]

Station.	Altitude.	Climatological data.						General soil type.
		Length of record.	Average precipitation.		Mean temperature (°F.).			
			Annual.	Seasonal.[1]	June.	July.	August.	
1	2	3	4	5	6	7	8	9
	Feet.	*Years.*	*Inches.*	*Inches.*				
Moccasin, Mont.	4,228	19	16.82	10.94	⑧58.0	⑧63.0	⑧63.0	Dark clay loam.
Williston, N. Dak.	1,875	33	14.90	10.43	㉚63.0	㉚68.6	㉚66.8	Fine sandy loam.
Dickinson, N. Dak.	2,543	25	15.85	11.19	⑰61.0	⑰68.1	⑰67.2	Clay loam to fine sandy loam.
Mandan, N. Dak.	1,750	[2]34	17.50	11.71	63.4	69.3	67.6	Sandy loam.
Langdon, N. Dak.	1,615	[3]11	16.83	11.09	.....	.....	.....	Black clay loam.
Edgeley, N. Dak.	1,468	[4]17	20.25	13.82	.....	.....	.....	Light sandy loam.
Newell, S. Dak.	2,950	9	13.98	8.68	65.0	72.0	69.0	Sticky clay (Pierre).
Cottonwood, S. Dak.	2,414	7	15.54	9.04	.....	.....	.....	Do.
Eureka, S. Dak.	1,884	7	16.43	8.71	.....	.....	.....	Glaciated sandy loam.
Highmore, S. Dak.	1,890	22	16.75	10.66	67.7	72.9	71.4	Glaciated clay loam.
North Platte, Nebr.	2,826	35	18.74	11.14	㉞68.0	㉞72.2	㉞72.1	Loess.
Archer, Wyo.	6,027	[5]39	13.80	7.92	61.0	67.0	65.9	Medium sandy loam with some gravel.
Akron, Colo.	4,560	13	19.13	11.90	⑧65.0	⑧71.0	⑧69.0	Sandy loam.

[1] For months of March to July, inclusive, at Akron, Colo., and Newell, S. Dak.; April to July, inclusive, at Archer, Wyo., and North Platte, Nebr., and April to August, inclusive, at Mandan, Edgeley, Dickinson, Williston, and Langdon, N. Dak., Cottonwood, Eureka, and Highmore, S. Dak., and Moccasin, Mont.

[2] Data recorded at Bismarck, N. Dak., about 4 miles east of Mandan; altitude at Bismarck, 1,674 feet.

[3] Data recorded at Woodbridge, about 24 miles northwest of Langdon.

[4] Data recorded at Berlin, about 12 miles east of Edgeley; altitude at Berlin, 1,470 feet.

[5] Data recorded at Cheyenne, Wyo., 8 miles west of Archer; altitude at Cheyenne, 6,088 feet.

As shown in Table XXV there is much variation in the altitude at the different stations. Edgeley, N. Dak., is the lowest, with an elevation of 1,468 feet, and Archer, Wyo., the highest, with an elevation of 6,027 feet above sea level.

The average annual precipitation does not exceed 21 inches at any of these stations. Archer, Wyo., has the lowest precipitation, 13.80 inches. At all stations more than half the precipitation occurs during the late spring and summer months, or during the growing season, when it is most needed by the oat plant.

Results in Montana.[a]

The Kherson and Sixty-Day varieties have been included in the cooperative varietal experiments on the Judith Basin substation at Moccasin, Mont., since work was begun there in 1908. A selection of the Sixty-Day was added in 1910. The following year two more selections of the same variety were included, and in 1916 two selections from Kherson, Albion (Iowa No. 103) and Richland (Iowa No. 105), were added. The annual and average yields of three strains of the Kherson, four strains of the Sixty-Day, and four other varieties of oats grown at Moccasin during two or more years of the 10-year period from 1908 to 1917, inclusive, are shown in Table XXVI.

TABLE XXVI.—*Annual and average yields of seven strains of Kherson and Sixty-Day and of four other varieties of oats grown at the Judith Basin substation, Moccasin, Mont., during two or more years in the 10-year period from 1908 to 1917, inclusive.*[1]

[Data obtained in cooperation with the Montana Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).											
		1908	1909	1910	1911	1913	1914	1915	1916	1917	Average. 1908 to 1911 and 1913 to 1917	Average. 1913 to 1917	Average. 1908 to 1911
Early yellow:													
Kherson	459	20.5	80.6	32.0	67.5	68.4	59.0	90.0	58.0	25.0	55.7	60.1	50.2
Sixty-Day	165	20.5	84.4	33.0	71.2	75.3	59.0	93.7	59.0	28.4	58.3	63.1	52.3
Sixty-Day selection	625	....	....	29.5	58.7	73.4	56.2	88.4	....	....	....	....	....
Do	626	....	....	....	53.7	80.0	56.0	95.6	59.7	24.4	....	63.1	....
Do	789	....	....	....	68.1	78.4	57.2	94.0	63.6	....	....	....	....
Albion (Iowa No. 103, white)	729	....	....	....	....	....	....	....	40.3	29.0	....	....	....
Richland (Iowa No. 105)	787	....	....	....	....	....	....	....	52.5	27.0	....	....	....
Early white:													
Early Champion	....	10.0	67.2	5.7	(2)	....	....	....	....	....	....	....	20.7
Midseason white:													
Danish	441	20.0	76.8	23.6	(2)	56.2	47.3	100.0	59.4	25.3	45.4	57.6	30.1
Swedish Select	134	15.0	77.0	22.3	(2)	53.1	50.0	108.0	65.7	22.5	46.0	59.9	28.6
Late white (side):													
White Tartar	300	13.3	67.3	18.0	(2)	....	....	....	....	....	....	....	24.7

[1] Crop destroyed by hail in 1912.
[2] Made second growth during rainy weather in August; not ripe when first frost came.

Reference to Table XXVI shows rather conclusively that the early varieties, Kherson and Sixty-Day, outyielded all other oats at Moccasin. The difference in yield in favor of these varieties over the midseason varieties is more than 10 bushels on the 9-year average. The Early Champion, an early white open-panicled variety, and the White Tartar, a late side oat, grown from 1908 to 1911, yielded much less each year than the Kherson and Sixty-Day. The two pure-line selections of Sixty-Day (C. I. Nos. 626 and 789) slightly exceeded the unselected Kherson and Sixty-Day in average yield.

[a] Data compiled from U. S. Department of Agriculture Bulletin 398 (14), and from unpublished annual reports of Mr. N. C. Donaldson, formerly scientific assistant in charge of cereal experiments at the Judith Basin substation, to the Office of Cereal Investigations.

Neither the Albion nor Richland, the two selections from Kherson, has yielded so well in the two years in which they have been tested as the original Kherson and Sixty-Day.

Results in North Dakota.

RESULTS AT WILLISTON.[1]

The Sixty-Day oat has been included in the varietal experiments at Williston since 1908, while the Kherson has been grown only since 1914. Two selections from Kherson, Albion (Iowa No. 103) and Richland (Iowa No. 105), were added to the tests in 1916. The annual and average yields of these and six other varieties which have been grown three or more years in the 10-year period from 1908 to 1917, inclusive, are presented in Table XXVII.

TABLE XXVII.—*Annual and average yields of the Sixty-Day, Kherson, and eight other varieties of oats grown at the Williston (N. Dak.) substation during two or more years in the 10-year period from 1908 to 1917, inclusive.*

[Data obtained in cooperation with the North Dakota Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).												
		1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Average. 1908 to 1917	Average. 1914 to 1917	Average. 1916 and 1917
Early yellow:														
Sixty-Day	165	28.8	76.3	4.2	11.2	50.3	45.0	82.2	85.1	78.8	44.3	50.6	72.6	61.6
Kherson	459	....	....	....	....	....	....	78.9	80.4	90.1	49.0	....	74.6	69.6
Albion (Iowa No. 103, white)	729	....	....	....	....	....	....	....	....	89.4	50.6	....	....	70.0
Richland (Iowa No. 105)	787	....	....	....	....	....	....	....	....	83.8	43.4	....	....	63.6
Midseason white:														
Abundance (N. Dak. No. 966)	731	31.3	91.1	12.5	7.7	104.7	93.4	123.9	99.4	103.2	47.5	71.5	93.5	75.4
Lincoln (N. Dak. No. 48)	738	32.1	96.2	15.6	7.0	101.3	84.5	124.3	99.1	101.9	45.6	70.8	92.7	73.8
Silvermine (N. Dak. No. 723)	714	37.4	103.3	14.8	7.3	95.7	67.5	120.7	100.0	101.9	46.6	69.5	92.3	74.3
Siberian (N. Dak. No. 864)	741	29.0	104.1	10.9	5.1	106.9	79.4	116.4	94.7	95.1	44.4	68.6	87.7	69.8
Swedish Select	134	28.4	86.0	7.8	9.9	84.4	68.8	97.3	101.7	97.8	41.8	62.4	84.7	69.8
Late white (side):														
White Russian (N. Dak. No. 51)	732	23.0	70.8	13.0	2.9	120.6	80.3	102.0	86.4	78.8	36.9	61.5	76.0	57.9

The results given in Table XXVII show that the Sixty-Day and Kherson do not yield nearly as well at Williston as the later or midseason varieties. The best of the midseason white varieties have decidedly outyielded the Kherson and Sixty-Day and therefore are to be recommended. In the 10-year period from 1908 to 1917, inclusive, the four highest yielding varieties of this group, viz, Abundance, Lincoln, Silvermine, and Siberian, have averaged 71.5, 70.8, 69.5, and 68.6 bushels, respectively, as compared with 50.6 bushels for the Sixty-Day. A strain of the White Russian, a late side oat, has also outyielded the Sixty-Day by about 11 bushels.

[1] Data from U. S. Department of Agriculture Bulletin 270 (4), 1915, and from annual reports of Mr. F. Ray Babcock, formerly scientific assistant in charge of cereal experiments at the Williston substation, to the Office of Cereal Investigations.

RESULTS AT DICKINSON.[a]

The Kherson and Sixty-Day oats have been included in the cooperative experiments at Dickinson since they were begun in 1907. Two selections from Kherson, Albion (Iowa No. 103) and Richland (Iowa No. 105), were added to the experiments in 1916. The annual and average yields of these and of ten other varieties of oats grown at Dickinson for two or more years in the 11-year period from 1907 to 1917, inclusive, are presented in Table XXVIII.

TABLE XXVIII.—*Annual and average yields of the Kherson, Sixty-Day, and ten other varieties of oats grown at the Dickinson (N. Dak.) substation during two or more years in the 11-year period from 1907 to 1917, inclusive.*

[Data obtained in cooperation with the North Dakota Agricultural Experiment Station.]

Group and variety	C. I. No.	Yield per acre (bushels).											Average.		
		1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1907 to 1917	1911 to 1917	1916 and 1917
Early yellow:															
Kherson	459	75.3	48.1	81.3	46.2	16.7	50.9	45.0	26.5	92.5	66.8	12.5	51.1	44.4	39.7
Sixty-Day	165	58.2	37.2	....	45.0	22.8	42.2	42.2	23.0	104.0	74.3	12.0	....	45.8	43.2
Albion (Iowa No. 103, white)	729	....	....	....	....	....	....	....	....	....	65.8	14.1	....	....	40.0
Richland (Iowa No. 105)	787	....	....	....	....	....	....	....	....	....	73.6	15.3	....	....	44.5
Midseason yellow:															
Golden Rain	493	35.2	52.8	82.2	35.6	14.4	62.8	70.9	20.0	129.3	66.8	18.0	53.5	54.6	42.4
Golden Beauty	169	....	....	....	....	....	....	76.3	25.2	121.2	71.0	20.2	....	....	45.6
Midseason white:															
Banner	160	46.8	41.6	89.4	(1)	6.2	65.0	48.1	17.7	117.8	54.3	17.6	45.9	46.7	36.0
Swedish Select	134	46.9	....	81.3	38.1	5.6	[2]52.3	61.9	16.8	101.5	75.0	21.6	....	47.8	48.3
Victory	560	....	42.5	88.3	(1)	8.9	59.4	70.6	18.6	123.9	79.2	22.2	....	54.7	50.7
Big Four	658	....	35.3	84.7	(1)	7.9	60.2	65.6	29.3	109.8	75.7	19.3	....	52.5	47.5
Silvermine	659	....	....	64.1	(1)	8.1	55.8	66.9	17.3	117.3	78.3	21.8	....	52.2	50.1
Early Mountain No. 2	656	....	....	....	(1)	[3]11.3	58.6	[4]67.3	24.8	105.3	74.7	18.7	....	51.5	46.7
Siberian	741	....	....	....	....	....	....	....	16.0	121.8	79.2	19.0	....	....	49.1
Late white (side):															
White Russian	551	62.8	28.1	64.3	(1)	14.3	(1)	53.4	24.5	99.8	74.0	10.5	39.2	39.5	42.3

[1] Destroyed by hail.
[2] Average of four check plats.
[3] Average of five check plats.
[4] Average of six check plats.

Only four varieties have been grown continuously since 1907. Of these, Golden Rain, a midseason yellow variety, has yielded best, with Kherson a close second. The materially lower yields of the other two varieties, Banner and White Russian, are due to the fact that hail destroyed the Banner in one year and the White Russian in two years, after the earlier varieties were harvested. The Sixty-Day has averaged 2 bushels less than the Kherson in the years both have been grown, but since 1910 it has averaged about 1 bushel more. Several varieties have been grown continuously in the 7-year period from 1911 to 1917, inclusive. In this period the Victory has outyielded all others, with Golden Rain ranking a very close second. Both these varieties are pure-line selections developed in

[a] Data from U. S. Department of Agriculture Bulletin 33 (11), and from annual reports of Mr. Ralph W. Smith, scientific assistant in charge of cereal experiments at the Dickinson (N. Dak.) substation, to the Office of Cereal Investigations.

Sweden. All the midseason varieties have outyielded the Sixty-Day and Kherson, which in turn have outyielded the late side oat, White Russian. From these results it appears that the better midseason varieties are to be preferred to the early ones for this section.

RESULTS AT MANDAN.[1]

The Sixty-Day oat has been included in varietal experiments at the Northern Great Plains Field Station, Mandan, N. Dak., since 1916. The annual and average yields of this and five other varieties grown during the years 1916 and 1917 are shown in Table XXIX.

TABLE XXIX.—*Annual and average yields of the Sixty-Day and five other varieties of oats grown at the Northern Great Plains Field Station, Mandan, N. Dak., during the years 1916 and 1917.*

[Data obtained in cooperation with the Office of Dry-Land Agriculture.]

Group and variety.	C. I. No.	Yield per acre (bushels).		
		1916	1917	Average.
Early yellow:				
Sixty-Day	165	46.4	41.3	43.9
Midseason yellow:				
Golden Rain	493	53.6	44.3	49.0
Midseason white:				
Victory	560	51.4	45.2	48.3
Early Mountain	656	54.3	32.0	43.2
Swedish Select	134	41.6	40.7	41.2
Late white (side):				
White Russian	744	48.0	37.6	42.8

The data shown in Table XXIX indicate that the best midseason varieties probably will outyield the Sixty-Day in central North Dakota, but data covering only two years are not sufficient to justify the drawing of definite conclusions. The results, however, are in accord with those obtained at Dickinson.

RESULTS AT LANGDON.

The annual and average yields of the Sixty-Day and six other varieties of oats grown at the Langdon substation (39) during the 5-year period from 1909 to 1913, inclusive, are presented in Table XXX.

TABLE XXX.—*Annual and average yields of the Sixty-Day and six other varieties of oats grown at the Langdon (N. Dak.) substation during the 5-year period from 1909 to 1913, inclusive.*

[Data compiled from annual reports of the Langdon subexperiment station (39).]

Group and variety.	Yield per acre (bushels).					
	1909	1910	1911	1912	1913	Average.
Early yellow:						
Sixty-Day	[2]66.8	8.0	40.0	54.7	36.3	41.2
Midseason white:						
Siberian	56.7	15.5	71.3	80.3	48.3	54.4
Big Four	72.0	14.8	64.4	66.7	45.3	52.6
Swedish Select	74.4	14.0	60.2	66.1	45.0	51.9
Late white (side):						
White Russian	60.0	20.8	76.5	73.4	57.0	57.5
Select Tartarian	54.0	20.3	75.8	80.5	53.8	56.9
New Zealand	50.0	21.3	76.5	78.1	56.0	56.4

[1] Data from unpublished annual reports of Mr. J. C. Brinsmade, jr., scientific assistant in charge of cereal experiments at the Northern Great Plains Field Station, to the Office of Cereal Investigations.

[2] Yield of the early yellow strain known as Seventy-five Day.

The data in Table XXX show that both the midseason and late white oats have decidedly outyielded the Sixty-Day at the Langdon substation.

The yields of the side-oat varieties, New Zealand, White Russian, and Select Tartarian, have averaged several bushels more than those of the midseason open-panicled varieties. This condition occurs so rarely that it seems worthy of special mention. Early oats are not recommended for this section of North Dakota. A panicle and spikelets of the White Russian oat are shown in figure 10.

FIG. 10.—Panicle and spikelets of a late white (side) variety of oats, White Russian.

RESULTS AT EDGELEY.

The annual and average yields of the Sixty-Day, the Kherson, and seven other varieties of oats grown at the Edgeley, N. Dak., substation (45, p. 28) during three or more years in the 10-year period from 1903 to 1912, inclusive, are presented in Table XXXI.

According to the data given in Table XXXI there is little choice between the early yellow and the midseason white varieties for growing in the vicinity of Edgeley. Only the Siberian, Sixty-Day, and Swedish Select have been grown during the entire period. They rank in average yield in the order named. In the six years from 1905 to 1910, inclusive, the Abundance, Big Four, Siberian, and Sixty-Day produced almost identical average yields. The results appear to be slightly in favor of the midseason varieties. It is probable that the rather thin soil of this section accounts for the better performance of early oats at Edgeley than elsewhere in North Dakota.

TABLE XXXI.—*Annual and average yields of the Kherson, the Sixty-Day, and seven other varieties of oats grown at the Edgeley (N. Dak.) substation during three or more years in the 10-year period from 1903 to 1912, inclusive.*

[Data compiled from the Tenth Annual Report of the Edgeley (N. Dak.) substation (45, p. 28).]

Group and variety.	Yield per acre (bushels).									
									Average.	
	1903	1905	1906	1907	1908	1909	1910	1912	1903, 1905 to 1910, and 1912	1908 to 1910	1905 to 1910
Early yellow:											
Sixty-Day	37.0	90.9	51.4	13.8	26.9	62.2	19.3	37.4	42.4	36.1	44.1
Kherson	.....	.....	.....	.....	27.4	67.8	24.3	.....	.....	39.8	.....
Midseason white:											
Siberian	46.3	91.2	64.8	24.3	12.7	65.9	6.3	52.5	45.5	28.3	44.2
Swedish Select	41.4	71.8	52.7	15.4	13.7	45.6	7.4	43.7	36.5	22.2	34.4
Silvermine	.....	90.7	56.7	19.9	12.7	60.3	7.4	.....	.....	26.8	41.3
Big Four	.....	85.1	70.4	23.5	13.7	63.1	10.5	55.8	.....	29.1	44.4
Abundance	.....	90.2	73.3	24.3	15.8	64.7	5.3	.....	.....	28.6	45.6
Late white (side):											
White Russian	.....	78.3	79.8	24.4	4.3	35.7	2.1	.....	.....	14.0	37.4
Select Tartarian	31.9	74.9	57.5	22.7	3.2	37.6	3.1	.....	.....	14.6	33.2

Results in South Dakota.[1]

RESULTS AT NEWELL.

The original strains of Kherson and Sixty-Day oats have been included in the varietal experiments at Newell since 1908. In 1910 two selections of the Sixty-Day were added and in 1912 two more of the same variety. These have been continued to date, except that one of the selections was not grown in 1916 and 1917. In addition, the strain known as Seventy-five Day was included for several years. Aside from the early yellow strains, seven other varieties have been grown in four or more years in the 9-year period from 1908 to 1916, nclusive. The annual and average yields of the leading selections and varieties grown at Newell are presented in Table XXXII.

The data given in Table XXXII indicate that the early yellow varieties, Kherson and Sixty-Day, are the most dependable for western South Dakota. The average yield of the Kherson in the 10-year period from 1908 to 1917, inclusive, is 31.6 bushels, compared with 26 and 22.7 bushels from Swedish Select and White Russian, respectively. In the 6-year period from 1912 to 1917, inclusive, a white-kerneled selection of Sixty-Day, C. I. No. 626, has outyielded the Kherson, Burt, Swedish Select, and White Russian varieties by 3, 2.9, 9.1, and 11.5 bushels, respectively.

[1] Data obtained cooperatively by the South Dakota station and the Bureau of Plant Industry. Data previous to 1914 were published in U. S. Department of Agriculture Bulletin 39 (10); in South Dakota Agricultural Experiment Station Bulletin 149 (17), and in U. S. Department of Agriculture Bulletin 297 (32).

TABLE XXXII.—*Annual and average yields of eight early yellow and four other varieties of oats grown at the Belle Fourche Experiment Farm, Newell, S. Dak., during two or more years in the 10-year period from 1908 to 1917, inclusive.*

[Data obtained in cooperation with the South Dakota Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).												
		1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Average. 1908 to 1917	Average. 1912 to 1917	Average. 1912 to 1915
Early yellow:														
Kherson	459	[1]47.5	[1]25.7	[1]15.0	0	6.2	21.9	13.8	110.8	40.8	33.8	31.6	37.9	38.2
Sixty-Day	165	[1]46.6	25.0	15.6	0	6.6	22.7	....	113.7	37.4	34.1	....	....	....
Sixty-Day selection	625	.....	.....	14.4	0	7.9	21.6	13.4	107.2	....	....	....	....	37.5
Do	626	.....	.....	16.6	0	9.9	24.6	14.2	117.1	43.4	35.9	....	40.9	41.5
Do	165–566	.....	.....	.....	....	7.1	23.3	12.2	106.7	41.8	33.8	....	37.5	37.3
Albion (Iowa No. 103, white)	729	.....	.....	.....	....	....	....	....	.....	35.6	30.6	....	....	....
Richland (Iowa No. 105)	787	.....	.....	.....	....	....	....	....	.....	33.5	30.6	....	....	....
Seventy-five Day	337	.....	.....	.....	....	7.5	21.0	12.8	102.5	....	....	....	....	36.0
Early red:														
Burt	293	.....	.....	.....	....	6.0	22.4	16.0	108.0	38.0	37.4	....	38.0	38.1
Midseason white:														
Swedish Select	134	38.1	28.4	2.3	0	9.2	15.2	0	113.7	33.0	19.7	26.0	31.8	34.5
Canadian	444	38.8	21.3	4.4	0	10.4	18.5	0	92.9	....	....	....	....	30.5
Late white (side):														
White Russian	551	30.9	20.0	0	0	22.7	14.3	0	106.1	26.8	6.4	22.7	29.4	35.8

[1] Average of two plats.

RESULTS AT COTTONWOOD.

The only varieties included in the experiments at the Cottonwood substation are the Sixty-Day and the Swedish Select. In Table XXXIII the annual and average yields of these varieties obtained at Cottonwood during the 9-year period from 1909 to 1917, inclusive, are presented.

TABLE XXXIII.—*Annual and average yields of the Sixty-Day and Swedish Select oat varieties grown at the Cottonwood and Eureka (S. Dak.) substations during the 9-year period from 1909 to 1917, inclusive.*

[Data obtained in cooperation with the South Dakota Agricultural Experiment Station.]

Station, group, and variety.	South Dakota No.	C. I. No.	Yield per acre (bushels).									
			1909	1910	1911	1912	1913	1914	1915	1916	1917	Average.
COTTONWOOD SUBSTATION.												
Early yellow: Sixty-Day	165	165	12.5	4.4	0	25.9	4.7	[1]14.8	[2]0	29.1	24.7	12.9
Midseason white: Swedish Select	112	134	7.2	6.3	0	16.6	.6	[1]9.4	[2]0	15.9	10.3	7.4
EUREKA SUBSTATION.												
Early yellow: Sixty-Day	165	165	37.2	20.2	0	6.1	15.8	37.5	110.6	60.1	46.2	37.1
Midseason white: Swedish Select	112	134	43.7	25.0	0	4.7	3.3	28.5	95.8	53.7	35.8	32.3

[1] Yield from method-of-seeding experiment at Cottonwood. [2] Destroyed by hail.

The data given in Table XXXIII indicate that the Sixty-Day is superior to the Swedish Select for growing in the vicinity of Cottonwood, though neither variety has produced profitable yields.

RESULTS AT EUREKA.

The only two varieties which have been grown at the Eureka substation, as at Cottonwood, are the Sixty-Day and the Swedish Select. These two varieties have been grown at that point continuously since 1909. Their annual and average yields in the 9-year period from 1909 to 1917, inclusive, are shown in Table XXXIII.

The results shown in Table XXXIII indicate that the Sixty-Day will outyield the Swedish Select variety under conditions similar to those at Eureka. The difference between the 9-year average yields of the two varieties is 4.8 bushels.

RESULTS AT HIGHMORE.

The Kherson and Sixty-Day oats have been included in the cooperative varietal experiments at Highmore since 1906. The annual and average yields of these and five other varieties of oats grown at Highmore in five or more years in the 12-year period from 1906 to 1917, inclusive, are presented in Table XXXIV.

TABLE XXXIV.—*Annual and average yields of the Kherson, the Sixty-Day, and five other oat varieties grown at the Highmore (S. Dak.) substation during five or more years in the 12-year period from 1906 to 1917, inclusive.*

[Experiments conducted in cooperation with the South Dakota Agricultural Experiment Station.]

Group and variety.	S. Dak. No.	C. I. No.	Yield per acre (bushels).												Average.	
			1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1906 to 1917	1906 to 1913
Early yellow:																
Sixty-Day	165	165	43.3	31.6	47.5	28.8	9.4	0	1.2	9.1	50.8	128.1	68.7	25.7	37.0	21.4
Kherson	115	539	69.7	28.8	39.0	21.9	10.0	0	.7	7.8	....	.....	....	....	.....	22.2
Early black:																
North Finnish Black	174	174	58.8	25.0	26.3	30.6	19.4	0	.3	.6	40.6	.....	....	....	.....	20.1
Early red:																
Red Algerian	286	286	49.1	21.9	32.8	23.4	35.0	0	(1)	....	....	.....	....	....	.....	.....
Midseason white:																
Swedish Select	112	134	65.0	30.8	30.3	36.6	25.0	0	.3	.9	34.4	93.8	40.6	12.1	30.8	23.6
Belyak	336	336	55.6	26.6	21.3	28.8	36.9	0	.7	.3	49.9	68.8	....	....	.....	21.3
Late white (side):																
White Tartar	.....	445	44.7	26.3	25.0	4.7	....	0	(1)	....	....	.....	....	....	.....	.....

[1] While very small yields were obtained in 1912, they were not sufficient to pay for harvesting and are, therefore, not considered.

Reference to Table XXXIV shows that the Sixty-Day has outyielded all other varieties at Highmore. The Kherson slightly exceeded it in average yield during the years it was grown, due to a wide difference in the yields of the 1906 crop. Except in this year the Sixty-Day usually has yielded more, and the Kherson has been discarded. The 12-year average of the Sixty-Day is 6.2 bushels higher than that of the Swedish Select, the highest yielding midseason white variety.

Results in Nebraska.

Table XXXV presents the annual and average yields of the Kherson, the Sixty-Day, and four other varieties of oats grown at the North Platte (Nebr.) substation (36, p. 17–18) during four or more years in the 9-year period from 1904 to 1912, inclusive.

TABLE XXXV.—*Annual and average yields of the Kherson, the Sixty-Day, and four other varieties of oats grown at the North Platte (Nebr.) substation during four or more years in the 9-year period from 1904 to 1912, inclusive.*[1]

[Data compiled from Nebraska Agricultural Experiment Station Bulletin 135 (36, p. 17-18).]

Group and variety.	Yield per acre (bushels).								
								Average.	
	1904	1905	1906	1908	1909	1910	1912	1905, 1906, and 1908 to 1910, inclusive.	1908 to 1910 and 1912.
Early yellow:									
Kherson	48.0	20.0	47.0	50.9	40.0	19.0	6.8	35.4	29.2
Sixty-Day	48.0	20.0	47.8	.....	36.0	15.9	8.8	.....	.....
Early red:									
Red Rustproof (Texas Red)	.....	29.0	43.3	40.7	38.2	9.8	.....	32.2	.....
Red Algerian	.....	.....	.....	27.2	34.2	5.0	7.5	.....	18.5
Burt	.....	.....	.....	50.7	38.2	19.0	15.8	.....	30.9
Midseason white:									
Swedish Select	.....	.....	.....	34.1	23.4	6.7	2.0	.....	16.6

[1] The varieties in 1907 were destroyed by freezing, and in 1911 the crop was a total failure, due to drought.

The data shown in Table XXXV indicate that the Kherson and the Sixty-Day varieties are superior to all others at North Platte, although the Burt has outyielded the Kherson in the four years, 1908, 1909, 1910, and 1912, by 1.7 bushels. Varieties other than the Sixty-Day, Kherson, Burt, and Red Rustproof are of little value in central and western Nebraska.

Results in Wyoming.[1]

The Kherson and Sixty-Day varieties have been included in the varietal experiments at the Cheyenne Experiment Farm, Archer, Wyo., since work was begun there in 1913. Two selections of Kherson from the Iowa station have been grown since 1916. Table XXXVI shows the annual and average yields of the unselected Kherson and Sixty-Day and of five other varieties of oats grown at Archer in the 5-year period from 1913 to 1917, inclusive, together with the yields of the two Kherson selections in 1916 and 1917.

[1] The results obtained in 1913, 1914, and 1915 were reported in U. S. Department of Agriculture Bulletin 430 (19). Later data are compiled from unpublished reports of Mr. V. H. Florell, scientific assistant, formerly in charge of cereal experiments at the Cheyenne Experiment Farm, to the Office of Cereal Investigations.

TABLE XXXVI.—*Annual and average yields of three strains of the Kherson, one strain of the Sixty-Day, and five other varieties of oats grown at the Cheyenne Experiment Farm, Archer, Wyo., in the 5-year period from 1913 to 1917, inclusive.*

[Experiments conducted in cooperation with the Wyoming State Board of Farm Commissioners.]

Group and variety.	C. I. No.	Yield per acre (bushels).					
		1913	1914	1915	1916	1917	Average.
Early yellow:							
Sixty-Day	165	15.8	25.6	[1] 29.9	9.6	27.4	21.7
Kherson	459	[2] 12.5	[2] 27.5	[1] 29.3	9.9	27.1	21.3
Albion (Iowa No. 103, white)	729	.....	.....	.....	[3] 5.0	25.7	.....
Richland (Iowa No. 105)	787	.....	.....	.....	9.0	27.0	.....
Midseason yellow:							
Probsteier	495	12.2	22.5	45.0	6.3	32.0	23.6
Midseason white:							
Swedish Select	134	10.0	26.7	52.1	7.7	35.3	26.4
Ligowo	492	10.5	23.6	48.7	8.6	40.3	26.3
Colorado No. 37	619	7.2	24.7	51.5	6.3	38.1	25.6
Late black (side):							
Black Tartarian	768	7.8	18.8	41.5	4.9	31.3	20.9

[1] Damaged about 30 per cent by hail. [2] Average of six tenth-acre check plats.
[3] Not comparable. A poor stand occurred, due to poor germination.

Table XXXVI shows that the three varieties classed as midseason white have outyielded the Sixty-Day and the Kherson. The best midseason white oat, Swedish Select, has outyielded the Kherson by 4.7 bushels. The Probsteier, a midseason yellow variety, also has outyielded both the Sixty-Day and the Kherson by about 2 bushels.

Although these tests have not been of sufficient duration to be conclusive, the evidence indicates that in this section of the Great Plains the midseason white varieties generally will outyield the Kherson and Sixty-Day and therefore are to be recommended.

Results in Colorado.[1]

Kherson and Sixty-Day oats have been included in the varietal experiments at the Akron (Colo.) Field Station since they were begun in 1908. The annual and average yields of these two varieties, three selections from them, and five other varieties of oats grown in one or more years in the 10-year period from 1908 to 1917, inclusive, are presented in Table XXXVII.

The data shown in Table XXXVII indicate that there is little choice at Akron between the Kherson and Sixty-Day and the midseason white varieties, Colorado No. 37 and Swedish Select. The Kherson has outyielded the Colorado No. 37 by a little more than 2 bushels, but the Sixty-Day has fallen below both the Colorado No. 37 and the Swedish Select by about the same quantity. A comparison of the yields for the years 1912 to 1917 shows that Burt, an early red oat, has slightly outyielded the Kherson. In this period

[1] The results obtained in 1915 and previous years were reported in U. S. Department of Agriculture Bulletin 402 (25). Later data are compiled from unpublished annual reports of Mr. George A. McMurdo, formerly scientific assistant in charge of cereal experiments at the Akron Field Station (1915) and Mr. F. A. Coffman, now scientific assistant in charge at Akron, to the Office of Cereal Investigations.

the Kherson has outyielded the best Sixty-Day strain by about 3 bushels and Colorado No. 37, the best of the midseason white varieties at Akron, by 7 bushels.

TABLE XXXVII.—*Annual and average yields of the Kherson, the Richland, the Albion, two strains of the Sixty-Day, and five other varieties of oats grown at the Akron (Colo.) Field Station during one or more years in the 10-year period from 1908 to 1917, inclusive.*

[Experiments conducted in cooperation with the Office of Dry-Land Agriculture Investigations.]

Group and variety.	C. I. No.	Yield per acre (bushels).												
		1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Average. 1908 to 1917	Average. 1912 to 1917	Average. 1916 to 1917
Early yellow:														
Kherson	459	52.8	33.1	37.1	12.4	36.0	36.1	65.0	85.0	16.8	14.7	38.9	42.3	15.8
Sixty-Day	165	42.9	37.2	21.9	3.3	33.4	28.1	65.0	82.6	12.5	14.9	34.2	39.4	13.7
Sixty-Day selection 4 P 2	788	.....	.....	32.0	4.2	40.0	26.2	61.2	74.2	9.3	.....	.....	.....	.....
Albion (Iowa No. 103, white)	729	.....	.....	.....	.....	.....	.....	.....	.....	8.6	24.0	.....	.....	16.3
Richland (Iowa No. 105)	787	.....	.....	.....	.....	.....	.....	.....	.....	12.5	.....	.....	.....	.....
Early red:														
Burt	293	.....	.....	.....	.....	48.2	36.8	63.1	82.6	11.7	13.9	.....	42.7	12.8
Midseason white:														
Colorado No. 37	619	36.8	55.6	29.9	[1]32.5	30.9	32.5	53.7	79.2	7.4	7.9	36.6	35.3	7.7
Swedish Select	134	62.5	50.6	29.5	15.9	30.9	27.5	48.7	69.4	10.5	9.2	35.5	32.7	9.9
Lincoln	738	.....	.....	.....	.....	.....	41.2	61.2	67.8	9.4	9.4	.....	.....	9.4
Late white (side):														
White Tartar	300	19.7	.....	.....	.....	23.4	23.7	42.1	65.0	0.7	4.1	.....	26.5	2.4

[1] Flat favorably located with regard to soil moisture. Under comparable conditions this variety would have yielded about the same as Swedish Select.

The Tartarian, a late white side oat, has an average yield of only 26.5 bushels for the same period, as compared with Burt, Kherson, Colorado No. 37, and Swedish Select, with 42.7, 42.3, 35.3, and 32.7 bushels, respectively. Early Champion, grown in 1908, 1909, and 1910 only, averaged 7 bushels to the acre less than Kherson in the same years.

Conclusions.

The average yield of the leading variety in each group at the stations included in the northern Great Plains is shown graphically in figure 11.

Except at the higher elevations in the northern Great Plains and in the extreme north, Sixty-Day and Kherson oats usually yield better than other varieties.

At the Judith Basin substation, in central Montana, Sixty-Day and Kherson oats have yielded slightly better than the midseason varieties.

At the Edgeley substation, in southeastern North Dakota, the Sixty-Day oat has yielded about the same as the best midseason varieties, but at other stations in the central and western portions of North Dakota, midseason varieties, such as Victory, Golden Rain, and Silvermine, have yielded considerably better than the early oats.

At several stations in central and western South Dakota, the Sixty-Day and Kherson oats have yielded better than the midseason and late varieties and are generally to be recommended in that State.

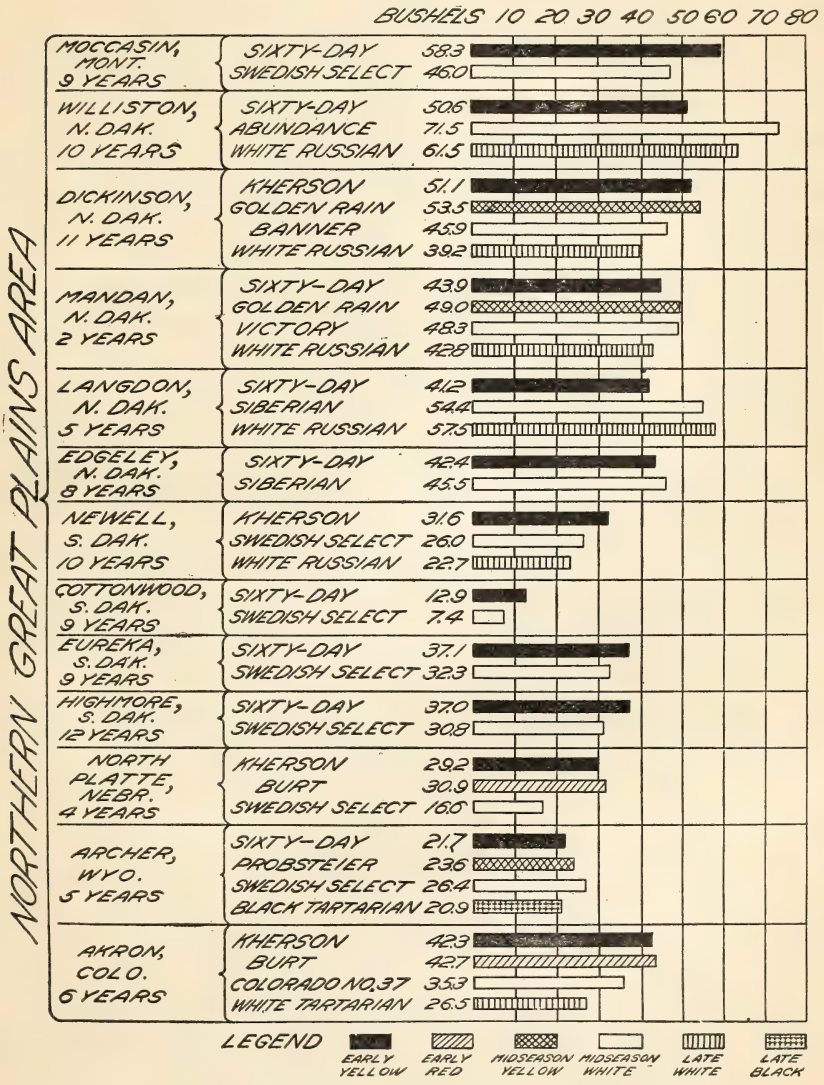

FIG. 11.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at thirteen agricultural experiment stations in the northern Great Plains area during the periods of years indicated.

At the North Platte substation in western Nebraska, the Burt, Red Rustproof, Kherson, and Sixty-Day oats have yielded equally well, exceeding considerably the later varieties.

At the Akron substation, in northeastern Colorado, there is little choice between the early and midseason varieties. At the Cheyenne Field Station, at an altitude of 6,000 feet, in southeastern Wyoming, the midseason varieties of oats have yielded better than the early ones.

RESULTS IN THE SOUTHERN GREAT PLAINS AREA.

The southern Great Plains include the western or semiarid portions of Texas, Oklahoma, and Kansas, southeastern Colorado, and eastern New Mexico.

The oat crop is not grown extensively in this area. The early red varieties, Red Rustproof and Burt, and the early yellow varieties, Kherson and Sixty-Day, are the most popular.

Varietal experiments with the Kherson, the Sixty-Day, and other oat varieties have been conducted under dry-land conditions at only two experiment stations in this section. The Kherson and the Sixty-Day varieties have been under test at the Amarillo Cereal Field Station, Amarillo, Tex., since 1906. Comparable data are available from the Hays Branch Experiment Station, Hays, Kans., only since 1913.

The climate of this section, like that of the northern Great Plains area, is generally classed as semiarid. As crop production is largely governed by climatic conditions, the altitude, the quantity and distribution of the annual precipitation, the normal annual and seasonal precipitation, and the mean temperatures for June, July, and August at Hays, Kans., and Amarillo, Tex., are shown in Table XXXVIII. The general soil type at each station also is shown.

TABLE XXXVIII.—*Altitude, average annual and seasonal precipitation, mean seasonal temperatures, and general soil types at the Hays (Kans.) Branch Experiment Station and the Amarillo (Tex.) Cereal Field Station.*

Station.	Altitude.	Climatological data.						General soil type.
		Length of record.	Average precipitation.		Normal temperature (°F).			
			Annual.	Seasonal.[1]	June.	July.	August.	
	Ft.	*Yrs.*	*Ins.*	*Ins.*				
Hays, Kans.	2,000	48	23.16	17.67	[2] 71.6	[2] 76.8	[2] 76.9	Silty clay loam.
Amarillo, Tex.	3,676	26	20.89	15.67	[3] 72.0	[3] 75.3	[3] 75.3	Chocolate clay loam.

[1] April to September, inclusive. [2] Twelve-year average. [3] Eighteen-year average.

Table XXXVIII shows that the greater portion of the precipitation occurs during the growing season, when the need for it is greatest. The high mean temperatures and high wind movement cause rapid loss of water by evaporation. As oats require more water than any other small-grain crop, the conditions just mentioned are not favorable to their best development.

Results at Hays, Kans.[1]

The Kherson and Sixty-Day varieties have been included in the experiments conducted at the Hays (Kans.) Branch Experiment Station since 1908, but comparable data are available from these experiments only since 1913. The annual and average yields of these and of two other varieties of oats grown at Hays during the four years from 1913 to 1916, inclusive, are given in Table XXXIX.

TABLE XXXIX.—*Annual and average yields of selections of the Kherson and Sixty-Day and of two other varieties of oats grown at the Hays (Kans.) Branch Experiment Station for three or more years in the 4-year period from 1913 to 1916, inclusive.*

[Data obtained in cooperation with the Kansas Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).					
		1913	1914	1915	1916	Average.	
						1914 to 1916	1913 to 1916
Early yellow:							
Albion (Iowa No 103, white)	729	5.8	17.2	12.1	8.0	12.4	10.8
Sixty-Day selection	626	6.4	14.0	11.7	5.8	10.5	9.5
Early red:							
Burt × Sixty-Day hybrid	727	5.8	18.4	22.6	12.4	17.8	14.8
Burt[1]	.....	.....	22.5	8.9	11.7	14.4	.....

[1] A commercial lot of Burt; not a pure line.

It will be noted from Table XXXIX that very poor yields were obtained at Hays; in fact, so poor that the crop is evidently not a profitable one. From the few data shown it appears that the Burt will outyield the Kherson and Sixty-Day in this section. The best yield at the station was produced by a Burt × Sixty-Day hybrid which is not yet commercially grown.

Results at Amarillo, Tex.[2]

The Kherson, the Sixty-Day, and the Seventy-five Day oats all have been included in the varietal experiments at Amarillo since 1906. Several selections of the Sixty-Day variety also have been included for shorter periods. The annual and average yields of these strains and of six other varieties and selections are shown in Table XL.

The data shown in Table XL indicate that the early red varieties, Red Algerian, Red Rustproof, and Burt, at Amarillo outyield the Kherson and Sixty-Day on the average from 2 to 4 bushels per acre. The average yield of the best red strain in the eleven years from 1906 to 1916, inclusive, is 20.6 bushels, compared with 18.9 bushels for

[1] Compiled from unpublished reports of Mr. F. A. Kiene, jr., formerly assistant agronomist in charge of cereal experiments at the Hays Branch Experiment Station, to the Office of Cereal Investigations.

[2] Data to and including 1911 were published in U. S. Department of Agriculture, Bureau of Plant Industry Bulletin 283 (31). Data from 1912 to 1917 have been compiled from unpublished reports of Mr. John F. Ross, the superintendent of the Amarillo Cereal Field Station, to the Office of Cereal Investigations.

the best Sixty-Day. The average yield of two strains of Red Algerian, one of Burt, and one of Red Rustproof range only from 19.8 to 20.6 bushels.

TABLE XL.—*Annual and average yields of five early yellow and six other varieties of oats grown at the Amarillo (Tex.) Cereal Field Station during six or more years in the 11-year period from 1906 to 1916, inclusive.*[1]

Group and variety.	C. I. No.	Yield per acre (bushels).											Average.		
		1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1906 to 1916	1911 to 1916	1907 to 1915
Early yellow:															
Sixty-Day	[2] 165	21.1	20.9	30.6	19.7	5.8	8.8	24.1	11.6	28.4	23.1	13.9	18.9	18.3	19.2
Do	[3] 165	....	24.4	32.5	16.3	3.9	11.7	22.5	10.0	29.1	20.3	....	....	....	19.0
Sixty-Day selection 4P4	789	....	....	....	....	....	12.5	26.2	13.2	28.7	20.3	14.7	....	19.3	....
Seventy-five Day	337	12.4	22.7	24.1	18.1	4.5	17.0	22.8	11.6	29.4	20.6	11.6	17.7	18.8	19.0
Kherson	459	11.5	15.2	20.6	19.1	4.5	16.7	24.1	6.2	29.4	18.1	10.8	16.0	17.6	17.1
Early red:															
Burt	[4] 293	13.3	16.2	23.4	16.6	8.0	18.7	21.6	16.9	40.3	31.1	[5] 11.9	19.8	23.4	21.4
Burt selection	293–VI.	....	10.3	23.4	12.8	9.3	20.6	20.9	14.1	40.0	30.3	....	....	....	20.2
Red Algerian	[6] 286	16.0	17.6	38.1	17.8	11.4	17.9	26.3	7.7	41.5	24.9	7.5	20.6	21.0	22.6
Do	[7] 286	10.6	20.4	30.3	19.1	10.9	16.3	28.4	8.7	45.0	23.4	7.3	20.0	21.5	22.5
Red Rustproof	458	19.8	19.3	32.7	9.7	9.0	17.8	25.9	11.9	39.4	29.4	10.0	20.4	22.4	21.7
Do	487	....	14.7	31.9	17.8	10.1	6.6	27.5	8.7	43.1	24.7	8.9	....	19.9	20.6

[1] Data to and including 1911 were previously published in Bur. Plant Indus. Bul. 283 (31).
[2] S. P. I. No. 5938.
[3] S. P. I. No. 17720.
[4] S. P. I. No. 15856.
[5] Yield from 6-peck rate in rate-of-seeding test.
[6] S. P. I. No. 12133.
[7] S. P. I. No. 15858.

Conclusions.

The average yield of the leading variety in each group at the stations included in the southern Great Plains is shown graphically in figure 12.

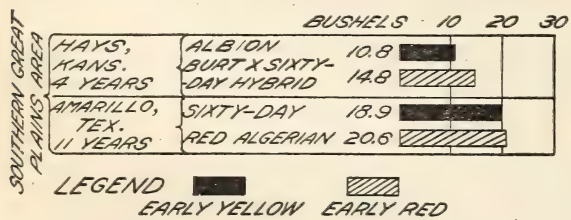

FIG. 12.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at two agricultural experiment stations in the southern Great Plains area during the periods of years indicated.

The data obtained at both Hays, Kans., and Amarillo, Tex., show that the early red varieties, Burt, Red Rustproof, and Red Algerian, are the best to grow in the southern Great Plains area. While the yields of the Kherson and Sixty-Day have been somewhat lower than those of the Burt and Red Rustproof, they doubtless are the next best varieties to grow.

RESULTS IN THE WESTERN BASIN AND COAST AREAS.

The western basin and coast areas include that portion of the United States lying west of the Rocky Mountains. The growing of oats and other small grains in this region is confined mostly to the less arid districts. The results of experiments under irrigation are reported in another section of this bulletin. The principal grain-

growing districts are the Great Basin, the Snake River Basin, the Columbia Basin, and the central valleys of California. These include parts of the States of Utah, Nevada, California, Idaho, Oregon, and Washington.

Varietal experiments with the Kherson and the Sixty-Day and other varieties of oats have been conducted at the following stations: Nephi, Utah; Aberdeen, Idaho; Burns and Moro, Oreg.; and Chico, Calif. At each of these points, except Chico, the work has been conducted cooperatively by the United States Department of Agriculture and the respective State agricultural experiment station. At Chico the work has been conducted in cooperation with the Office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry. The experiments at Pullman and Puyallup, Wash., were conducted and reported independently by the Washington Agricultural Experiment Station. The results of cereal experiments at the Oregon Agricultural Experiment Station at Corvallis have never been published.

The climate of these basins and valleys, except that of Puget Sound, is exceedingly dry, varying from semiarid to arid. Table XLI contains a record of the altitude, annual and seasonal precipitation, mean temperatures for June, July, and August, and the general soil type at each of the seven stations in this section.

As a rule, the precipitation of these sections is markedly low, and most of it occurs during the autumn, winter, and spring months. This is the reverse of the conditions in the Great Plains area, where the greater portion of the precipitation occurs during the summer months, the growing season. For this reason winter rather than spring grains are grown in this section.

TABLE XLI.—*Altitude, average annual and seasonal precipitation, mean seasonal temperatures, and general soil types at seven experiment stations in the western basin and coast areas.*

Station.	Altitude.	Climatological data.						General soil type.
		Length of record.	Average precipitation.		Mean temperature (°F.).			
			Annual.	Seasonal.[1]	June.	July.	August.	
	Feet.	*Years.*	*Inches.*	*Inches.*				
Nephi, Utah	6,000	18	13.44	3.75	.....	.....	.....	Sandy clay loam.
Aberdeen, Idaho	4,400	6	9.20	4.16	.....	.....	.....	Sandy clay loam (lava ash).
Burns, Oreg.	4,100	12	11.74	2.67	[2]57.4	[2]65.8	[2]64.7	Silt loam to very fine sandy loam.
Moro, Oreg.	1,800	11	11.35	3.70	[5]59.6	[c]67.8	[3]67.4	Silt loam.
Pullman Wash.	.....	[4]17	22.51	6.17	58.4	66.8	65.6	
Puyallup, Wash.	.....	[5]25	43.01	8.21	59.4	63.4	63.0	Clay ("Upland shot").
Chico, Calif.	189	40	23.39	.....	77.1	83.9	81.5	Sandy loam.

[1] For months of April to June, inclusive, at Nephi, Utah; April to July, inclusive, at Aberdeen, Idaho, Burns, Oreg., Pullman and Puyallup, Wash.; and March to July, inclusive, at Moro, Oreg.
[2] Sixteen-year average.
[3] Five-year average.
[4] Data recorded at Moscow, Idaho, about ten miles east of Pullman, Wash.; altitude at Moscow 2,748 feet.
[5] Data recorded at Tacoma, 10 miles northwest of Puyallup, Wash.

The altitude of Nephi, Utah (6,000 feet), is the highest of the stations here discussed, and that of Chico, Calif. (189 feet), is the lowest. Aberdeen and Burns each have an altitude of more than 4,000 feet. At the Burns station in the Harney Valley frost frequently occurs during the summer months. The advantage of early varieties of oats over midseason or late varieties is apparent under such conditions. The summers are very warm and evaporation is fairly high, but wind velocities are low in most of these sections. The soils for the most part vary from sandy clay to silt loams.

Results in Utah.[1]

The Sixty-Day oat has been included in the cooperative varietal experiments at Nephi since the work was started at that station in 1908. The Kherson variety was grown only during the years 1909 to 1911, inclusive. Two selections of Kherson from the Iowa station were added to the experiments in 1916. In addition to these, only a few other varieties have been included in the tests at Nephi. The annual and average yields of those varieties which have been grown during three or more years in the 10-year period from 1908 to 1917, inclusive, are presented in Table XLII.

TABLE XLII.—*Annual and average yields of the Sixty-Day, the Kherson, the Richland, the Albion, and four other varieties of oats grown at the Nephi (Utah) substation during two or more years in the 10-year period from 1908 to 1917, inclusive.*

[Data obtained in cooperation with the Utah Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).												
												Average.		
		1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1908 to 1917	1910 to 1917	1916 and 1917
Early yellow:														
Sixty-Day	165	16.0	15.0	[a]2.8	2.8	15.3	6.3	30.6	36.1	10.6	19.4	15.5	15.5	15.0
Kherson	459	.....	16.6	0.6	5.9	....	....	.....	.....	.....	.....	....	....	....
Albion (Iowa No. 103, white)	729	.....	.....	.....	.....	....	....	.....	.....	15.6	21.7	....	....	18.7
Richland (Iowa No. 105)	787	.....	.....	.....	.....	....	....	.....	.....	16.6	20.0	....	....	18.3
Midseason yellow:														
Giant Yellow (side)	568	9.7	16.3	6.9	12.2	21.4	12.8	22.5	31.3	.....	.....	.....	.....	.....
Midseason white:														
Swedish Select	134	[3]44.1	[2]15.4	[4]6.2	8.8	24.1	13.1	30.7	[5]39.1	[5]15.8	[5]8.6	20.6	18.3	12.2
Roosevelt	752	.....	.....	10.9	[6]11.5	26.6	11.6	35.0	30.3	15.9	2.8	....	18.1	9.4
Midseason black:														
Black American	549	15.6	15.6	8.4	11.6	25.3	13.5	29.4	[5]42.5	[5]16.9	[5]14.7	19.4	20.3	15.8
Winter:														
Boswell (black)	480	.....	16.0	5.3	38.1	11.1	(7)	[8]44.4	[5]56.9	9.7	20.0	....	23.2	14.9

[1] Data obtained cooperatively by the Utah Agricultural Experiment Station and the Bureau of Plant Industry. The data previous to 1917 have been reported in the following publications: U. S. Department of Agriculture Bulletin 30 (8); U. S. Department of Agriculture Farmers' Bulletin 883 (20); and Utah Agricultural Experimental Station Circular 21 (16).

[2] Average yield of five plats.

[3] Grown on land which has been fallow for two years. All the other varieties were grown in 1908 on plats which had produced wheat the previous season.

[4] Average yield of four plats.

[5] Yield of selection, original stocks not grown.

[6] Average yield of three plats.

[7] Completely winterkilled.

[8] From 6-peck rate in rate-of-seeding test.

The data given in Table XLII show that the midseason white varieties have outyielded the early yellow ones at Nephi in a series of years. The table also shows that in the 8-year period from 1910 to 1917, inclusive, the Boswell Winter oat has outyielded all others, despite the fact that in 1913 this variety entirely winterkilled.

In the two years (1916 and 1917) in which they have been tested, Albion and Richland, the two selections from Kherson, have outyielded all others at Nephi and appear to be of considerable promise for central Utah.

Results in Idaho.[1]

The Kherson and Sixty-Day varieties have been included in the dry-land experiments at Aberdeen, Idaho, since 1911, when cooperative cereal investigations were begun at that station. Only two other varieties, Swedish Select and a white selection from an oat known as "Rustless," have been included. These latter were grown only during the years 1915, 1916, and 1917. Table XLIII shows the annual and average yields of these varieties at Aberdeen.

TABLE XLIII.—*Annual and average yields of the Kherson, the Sixty-Day, and two other varieties of oats grown at the Aberdeen (Idaho) substation during three or more years in the 5-year period from 1913 to 1917, inclusive.*

[Data obtained in cooperation with the Idaho Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).						
		1913	1914	1915	1916	1917	Average. 1913 to 1917	Average. 1915 to 1917
Early yellow:								
Sixty-Day	165	47.5	40.3	[1]28.1	16.8	28.7	32.3	24.5
Kherson	723	38.1	32.5	26.4	16.2	29.3	28.5	24.0
Midseason white:								
"Rustless" selection (Iowa No. 444)	724	.....	.....	24.8	19.2	28.7	.....	24.2
Swedish Select	134	.....	.....	18.2	15.0	19.3	.....	17.5

[1] Average of two plats.

The early yellow varieties, Kherson and Sixty-Day, have decidedly outyielded the Swedish Select, a midseason white variety. The superiority of the early varieties has been so marked in a practical as well as in an experimental way that it has not been thought worth while to include varieties representing other types in the experiments on dry land.

[1] Compiled from unpublished reports of Mr. L. C. Aicher, the superintendent of the Aberdeen substation, to the Office of Cereal Investigations. Data obtained previous to 1916 are summarized in U. S. Department of Agriculture Farmers' Bulletin 769 (1).

Results in Oregon.

RESULTS AT BURNS.[1]

The Kherson and Sixty-Day oats have been included in the cooperative varietal experiments at Burns since they were begun in 1913. Two selections of the Sixty-Day variety have been grown since 1913, and an additional one since 1914. The annual and average yields of these and of three other varieties which have been grown during the 5-year period from 1913 to 1917, inclusive, are presented in Table XLIV.

TABLE XLIV.—*Annual and average yields of three early yellow and four other varieties of oats grown at the Harney Branch Experiment Station, Burns, Oreg., during the 5-year period from 1913 to 1917, inclusive.*

[Data obtained in cooperation with the Oregon Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).					
		1913	1914	1915	1916	1917	Average, 1913 to 1917.
Early yellow:							
Kherson	459	60.7	16.9	22.3	43.1	10.5	30.7
Sixty-Day selection	625	55.0	19.8	21.9	42.7	11.2	30.1
Sixty-Day selection 4P4	789	.....	19.7	19.2	43.9	10.2	.....
Midseason white:							
"Rustless" selection (Iowa No. 444)	724	56.2	11.2	49.4	45.0	9.3	34.2
Silvermine	720	63.7	14.0	25.0	43.1	9.3	31.0
Swedish Select	134	33.1	12.8	29.4	43.7	3.8	24.6
Midseason black:							
Black American	549	61.9	12.3	26.4	28.5	1.9	26.2

A selection from a variety at the Iowa station known as Rustless, Iowa No. 444 and C. I. No. 724, somewhat similar to Silvermine, has been the highest yielder in the 5-year period at Burns, with an average yield of 34.2 bushels, compared with 31.0, 30.7, 30.1, and 24.6 bushels from Silvermine, Kherson, Sixty-Day (C. I. No. 625), and Swedish Select, respectively.

While these experiments have not been of sufficient duration to warrant definite conclusions, indications are that the Silvermine type is slightly better than the Sixty-Day to grow in the Harney Valley, except where early maturity is a distinct advantage.

RESULTS AT MORO.[2]

The Kherson and Sixty-Day oats have been included in the cooperative varietal experiments at Moro since the cereal work was begun there in 1911. In addition, three selections from the Sixty-Day,

[1] Compiled from unpublished annual reports of Mr. L. R. Breithaupt, formerly superintendent of the Harney Branch Experiment Station, to the Office of Cereal Investigations. Data obtained previous to 1917 are summarized in U. S. Department of Agriculture Farmers' Bulletin 800 (6).

[2] Data obtained cooperatively by the Oregon Agricultural Experiment Station and the Bureau of Plant Industry. Data previous to 1917 were published in U. S. Department of Agriculture Bulletin 498 (37) and in Oregon Agricultural Experiment Station Bulletin 144 (38).

two selections from the Kherson, and seven other varieties and selections of oats have been grown at Moro for two or more years in the 7-year period from 1911 to 1917, inclusive. The annual and average yields of these are presented in Table XLV.

TABLE XLV.—*Annual and average yields of six early yellow and eight other varieties and selections of oats grown at the Eastern Oregon Dry-Farming Branch Experiment Station (at Moro) during two or more years in the 7-year period from 1911 to 1917, inclusive.*

[Data obtained in cooperation with the Oregon Agricultural Experiment Station.]

Group and variety.	C.I. No.	Yield per acre (bushels).									
									Average.		
		1911	1912	1913	1914	1915	1916	1917	1911 to 1917	1914 to 1917	1916 and 1917
Early yellow:											
Kherson	459	28.9	39.6	43.6	54.2	52.6	84.4	37.5	48.7	57.2	61.0
Sixty-Day	165	18.7	40.0	47.8	52.3	57.8	83.8	40.0	48.6	58.5	61.9
Sixty-Day selection	789	11.2	37.1	66.5	33.7	.....	.....	.....	.....	.....	.....
Do	165–1–1	.....	.....	45.6	61.9	57.1	.....	.....	.....	.....	.....
Do	165–1	.....	.....	.....	65.6	57.2	80.3	37.2	.....	60.1	58.8
Albion (Iowa No. 103, white)	729	.....	.....	.....	.....	.....	71.5	38.8	.....	.....	55.2
Richland (Iowa No. 105)	787	.....	.....	.....	.....	.....	86.9	40.6	.....	.....	63.8
Midseason white:											
Swedish Select	134	13.5	37.0	40.7	37.2	47.0	105.9	28.8	44.3	54.7	67.4
Siberian	635	30.8	35.6	53.7	37.0	58.3	99.6	29.1	49.2	56.0	64.4
Canadian	444	17.1	38.4	46.4	45.2	48.9	68.8	28.4	41.9	47.8	48.6
Shadeland Climax	681	.....	44.3	36.5	35.1	55.3	91.0	26.3	.....	51.9	58.7
Midseason black:											
Black American	549	35.1	35.1	42.5	33.8	43.4	97.1	.....	.....	.....	.....
Late white (side):											
Storm King	522–1	.....	.....	46.2	35.6	63.0	.....	.....	.....	.....	.....
White Russian	636	13.7	28.1	30.0	.....	.....	.....	.....	.....	.....	.....

The results at Moro, as shown in Table XLV, are similar to those obtained at Burns. They indicate that there is little choice between the early yellow and the midseason white varieties for growing in the Columbia Basin. The five varieties which have been grown during the entire 7-year period are Siberian, Kherson, Sixty-Day, Swedish Select, and Canadian, with average yields of 49.2, 48.7, 48.6, 44.3, and 41.9 bushels, respectively. In the 4-year period, 1914 to 1917, inclusive, a selection from Sixty-Day, 165–1, leads with an average yield of 60.1 bushels, which is 4.1 bushels higher than that of the Siberian, the best midseason variety, and 1.6 bushels higher than that of the original Sixty-Day. The earlier maturity of the Kherson and Sixty-Day varieties also must be taken into consideration, as earliness is frequently a decided advantage in this section of the country.

Results in Washington.

RESULTS AT PULLMAN.

The annual and average yields of the Sixty-Day and four other varieties of oats grown at the Washington Agricultural Experiment Station at Pullman (33) in 1914 and 1915 are shown in Table XLVI.

TABLE XLVI.—*Annual and average yields of the Sixty-Day and four other varieties of oats grown at the Washington Agricultural Experiment Station (at Pullman) in 1914 and 1915.*

[Data compiled from Washington Agricultural Experiment Station Bulletin 129 (33).]

Group and variety.	Washington No.	Yield per acre (bushels).		
		1914	1915	Average.
Early yellow:				
Sixty-Day	661	69.6	84.9	77.3
Midseason white:				
Abundance	759	87.4	76.1	81.8
Banner	764	80.2	76.3	78.3
Swedish Select	662	75.4	81.0	78.2
Sparrowbill[1]	741	76.0	77.0	76.5

[1] Not true Sparrowbill, which is a side oat; probably Danish.

The few data presented in Table XLVI indicate that there is little choice between the early yellow and the midseason white varieties for growing in the Palouse district of eastern Washington. The average yields of the varieties in the two groups are about the same.

RESULTS AT PUYALLUP.

The average yields of the Sixty-Day and eight other varieties of oats grown from spring seeding at the Western Washington Agricultural Experiment Station at Puyallup (40, p. 11–12) in the 3-year period from 1914 to 1916, inclusive, are shown in Table XLVII.

TABLE XLVII.—*Average yields of the Sixty-Day and eight other varieties of oats grown at the Western Washington Experiment Station (at Puyallup) during 1914, 1915, and 1916.*

[Data compiled from Washington Agricultural Experiment Station Monthly Bulletin for April, 1917 (40, pp. 11–12).]

Group and variety.	Yield per acre.	Group and variety.	Yield per acre.
Early yellow:	*Bushels.*	Midseason white—Continued.	*Bushels.*
Sixty-Day	51.7	White Bonanza	54.7
Midseason white:		Canadian	53.4
Swedish Select	63.2	Midseason black:	
Big Four	59.8	Black	56.5
Ligowo selection (Minn. No. 281)	59.5	Late white (side):	
Swedish Select (Shadeland Climax)	56.7	Sparrowbill	59.4

It is realized that the data contained in Table XLVII are too meager to be conclusive. However, they indicate that the best midseason varieties probably will outyield the Sixty-Day under western Washington conditions. The high rainfall and comparatively cool growing season of the Puget Sound district naturally favor the larger midseason varieties.

Results in California.[1]

The Sixty-Day oat has been included in the cooperative varietal experiments at the Plant Introduction Garden at Chico, Calif., since

[1] Data from unpublished annual reports of Mr. E. L. Adams, formerly assistant agronomist in charge of cereal experiments at the Plant Introduction Garden, to the Office of Cereal Investigations.

they were begun in 1910. The annual and average yields of the Sixty-Day and four other varieties grown during four or more years of the 7-year period from 1910 to 1916, inclusive, are shown in Table XLVIII. Owing to the lack of land no varieties of oats were grown at Chico in 1917.

TABLE XLVIII.—*Annual and average yields of the Sixty-Day and four other varieties of oats grown at the Plant Introduction Garden at Chico, Calif., for five or more years in the 7-year period from 1910 to 1916, inclusive.* [1]

[Data obtained in cooperation with the Office of Foreign Seed and Plant Introduction.]

Group and variety.	C. I. No.	Yield per acre (bushels).							
		1910	1911	1913	1914	1915	1916	Average. 1910 to 1916	Average. 1913 to 1916
Early yellow:									
Sixty-Day	165	31.0	52.3	[2] 43.8	39.2	20.9	26.3	35.6	32.6
Early red:									
Red Rustproof (Calif. Red)	616	24.3	65.6	41.8	43.3	27.3	28.5	38.5	35.2
Midseason white:									
Danish Island	519	.....	.....	35.3	51.4	24.5	20.4	.....	32.9
Silvermine	520	.....	.....	23.0	38.5	17.0	21.3	.....	25.0
Winter:									
Winter Turf (Dewey)	180	.....	88.7	36.3	36.7	24.8	23.6	.....	30.4

[1] Yields of oats not comparable in 1912; plats were badly infested with wild oats and other weeds.
[2] Average of four check plats.

Reference to Table XLVIII shows that in the six years, 1910, 1911, and 1913 to 1916, inclusive, the Red Rustproof has outyielded the Sixty-Day by 2.9 bushels at Chico. In the 4-year period from 1913 to 1916, inclusive, the difference is about the same in favor of the Red Rustproof. In this period the Danish Island also has slightly outyielded the Sixty-Day. These tests indicate that the Red Rustproof is to be preferred to all others in the central valleys of California. This is in accordance with the experience of farmers, and as a consequence the Red Rustproof is the variety commonly grown in California, where it is known as California Red, or Common California.

Conclusions.

The average yield of the leading variety in each group at the stations included in the western basin and coast areas is shown graphically in figure 13.

The results presented in Tables XLII to XLVIII, inclusive, show that the early yellow varieties, Kherson and Sixty-Day, are high yielders under dry-land conditions at all the stations west of the Rocky Mountains with the exception of Nephi, Utah. The climatic conditions at this station seem to favor the midseason varieties. In western Washington (Puyallup) the rainfall is too heavy for it to be classed as a dry-land section. At the other four stations usually one or more of the midseason white varieties have slightly outyielded the Kherson and Sixty-Day.

The ability of the Sixty-Day and Kherson varieties to yield as well as the midseason varieties and to mature 10 days to two weeks earlier gives a distinct advantage, and they therefore are to be recommended.

RESULTS UNDER IRRIGATION.

The Kherson and Sixty-Day oats are not extensively grown under irrigation. As a rule, the larger and later maturing varieties are grown, as they usually yield better. However, where the growing season is short the early varieties are desirable and often yield sur-

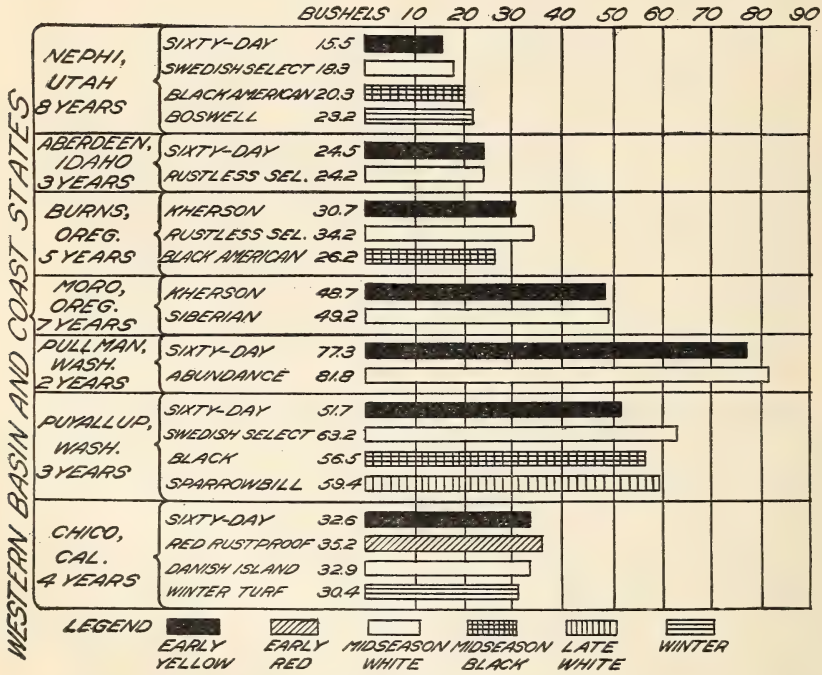

FIG. 13.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats at seven agricultural experiment stations in the western basin and coast areas during the periods of years indicated.

prisingly well. Cooperative varietal experiments with Kherson and Sixty-Day oats have been conducted under irrigation at Newell, S. Dak., and Aberdeen, Idaho, for six and five years, respectively. In addition, results of experiments with Kherson and Sixty-Day oats under irrigation conducted independently by the Nevada and Montana agricultural experiment stations at Reno and Bozeman and at the Gooding (Idaho) substation are presented herewith.

The general physical conditions at these stations are shown in Table XLIX.

Under irrigation, precipitation naturally ceases to be a limiting factor in crop production, and because of the availability of an ample

water supply the period of plant growth is lengthened somewhat. As the oat plant requires large quantities of water for its best development, high yields of grain of excellent quality usually are produced in irrigated districts.

TABLE XLIX.—*Altitude, average annual and seasonal precipitation, mean seasonal temperatures, and general soil types at five experiment stations in the northern Great Plains and western basin areas.*

Station.	Altitude.	Climatological data.						General soil type.
		Length of record.	Average precipitation.		Mean temperature (°F.).			
			Annual.	Seasonal.[1]	June.	July.	Aug.	
	Feet.	*Years.*	*Inches.*	*Inches.*				
Newell, S. Dak.	2,950	9	13.98	9.20	65.0	72.0	69.0	Sandy loam.
Bozeman, Mont.	4,700	35	18.60	10.97	[2] 58.7	[2] 65.8	[2] 64.3	
Aberdeen, Idaho	4,400	6	9.80	4.84	.....	.....	.....	Sandy clay loam, lava ash.
Gooding, Idaho	3,600	7	9.20	2.92	62.3	70.1	68.5	Medium clay loam.
Reno, Nev.	4,532	22	8.65	2.15	62.4	69.8	69.2	

[1] April to August, inclusive. [2] Twenty-nine year average.

Results under Irrigation in South Dakota.

The Sixty-Day oat has been included in varietal experiments conducted under irrigation at Newell since 1912. The annual and average yields of the Sixty-Day and of three other varieties which have been grown during the 6-year period from 1912 to 1917, inclusive, together with the yields of one variety grown during three years, are given in Table L.

TABLE L.—*Annual and average yields of the Sixty-Day and four other varieties of oats grown under irrigation at the Belle Fourche Experiment Farm, Newell, S. Dak., during three or more years in the 6-year period from 1912 to 1917, inclusive.*

[Data obtained in cooperation with the Office of Western Irrigation Agriculture and since 1912 with the South Dakota Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).							
		1912	1913	1914	1915	1916	1917	Average.	
								1912 to 1917	1914 to 1917
Early yellow:									
Sixty-Day	165	25.0	47.1	32.5	34.0	28.8	51.5	36.5	36.7
Midseason white:									
Swedish Select	134	35.2	33.0	41.6	46.5	36.9	54.6	41.3	44.9
Canadian	444	31.2	39.3	42.4	44.7	25.2	65.8	41.4	44.5
Unnamed[1]	778	.....	.....	50.7	51.8	37.4	57.8	.....	49.4
Late white (side):									
White Russian	551	41.4	33.7	48.6	52.8	42.1	56.2	45.8	49.9

[1] Similar to Swedish Select; original seed supposed to have been obtained from Norway.

The results shown in Table L decidedly favor the midseason and late varieties for growing under irrigated conditions similar to those at Newell. Of the four varieties under experiment during the full 6-year period the White Russian leads with an average yield of 45.8 bushels, as compared with 36.5 bushels for the Sixty-Day, a difference of nearly 10 bushels. In the 4-year period from 1914 to 1917, inclusive, the White Russian and a local variety similar to Swedish Select lead with average yields of 49.9 and 49.4 bushels, respectively, as compared with an average of 36.7 bushels for the Sixty-Day during the same period.

Results under Irrigation in Montana.

The average yields of the Kherson, the Sixty-Day, and eight other varieties of oats grown under irrigation at the Montana Agricultural Experiment Station at Bozeman (2) in the 5-year period from 1907 to 1911, inclusive, are shown in Table LI.

TABLE LI.—*Average yields of the Kherson, the Sixty-Day, and eight other varieties of oats grown under irrigation at the Montana Agricultural Experiment Station (at Bozeman) during the 5-year period from 1907 to 1911, inclusive.*

[Data compiled from Montana Agricultural Experiment Station Bulletin 84 (2).]

Group and variety.	Yield per acre.	Group and variety.	Yield per acre.
Early yellow:	*Bushels.*	Midseason white—Continued.	*Bushels.*
Sixty-Day	73.9	Siberian	98.3
Kherson	82.0	Swedish Select	97.9
Early white:		Late white (side):	
Early Champion	70.9	Sparrowbill	93.1
Midseason white:		Tartar King	90.0
Banner	102.3	White Tartar	80.2
Danish	100.0		

Reference to Table LI shows that both the midseason and the late varieties have materially outyielded the Sixty-Day and Kherson at Bozeman on irrigated land. Banner, the highest yielding midseason oat, has exceeded the Kherson and the Sixty-Day in average yield by about 20 and 30 bushels, respectively, during the 5-year period. As indicated by these results, it is usually more profitable to grow the midseason and late varieties under conditions similar to those at Bozeman, unless for some reason an early-maturing oat is required.

In a recent publication (3, p. 166–167) the Montana Agricultural Experiment Station reports that Ontario A. C. No. 72, a selection from Siberian imported from Canada, yields best under irrigation. During the past four years it has averaged 119.4 bushels per acre. Other varieties showing high average yields under irrigation were Myrick, Silvermine, Belyak, and Banner with yields of 114.9, 113.9, 110.1, and 109.6 bushels per acre, respectively.

Results under Irrigation in Idaho.

RESULTS AT ABERDEEN.[1]

The Kherson and Sixty-Day oats have been included in the cooperative varietal experiments conducted under irrigation at Aberdeen, Idaho, since 1913, when experimental work was begun at that station. Albion and Richland, two selections of Kherson from the Iowa station, were added to the tests in 1916. In Table LII the annual and average yields of these and seven other varieties grown at Aberdeen during two or more years in the 5-year period from 1913 to 1917, inclusive, are presented.

TABLE LII.—*Annual and average yields of the Kherson, Sixty-Day, Richland, Albion, and seven other varieties of oats grown under irrigation at the Aberdeen (Idaho) substation during two or more years in the 5-year period from 1913 to 1917, inclusive.*

[Data obtained in cooperation with the Idaho Agricultural Experiment Station.]

Group and variety.	C. I. No.	Yield per acre (bushels).						
		1913	1914	1915	1916	1917	Average. 1913 to 1917	Average. 1916 and 1917
Early yellow:								
Kherson	423	88.7	110.0	160.2	119.2	116.2	118.9	117.7
Sixty-Day	165	103.0	101.4	161.9	98.5	90.6	111.1	94.6
Albion (Iowa No. 103, white)	729	.....	.....	.....	106.2	123.1	.....	114.7
Richland (Iowa No. 105)	787	.....	.....	.....	114.2	109.3	.....	111.8
Midseason yellow:								
Golden Rain	493	126.2	98.8	153.5	111.0	110.6	120.0	110.8
Midseason white:								
Early Mountain	754	103.8	120.3	158.5	111.0	111.8	121.1	111.4
Silvermine	720	102.2	113.4	163.6	106.2	109.3	118.9	107.8
Swedish Select	134	[1] 104.2	97.1	163.6	93.7	102.5	112.2	98.1
"Rustless" selection	724	103.8	120.3	158.5	[2] 68.7	120.6	114.4	94.7
Lincoln	756	73.1	115.6	163.6	96.2	98.1	109.3	97.2
Late white (side):								
Tartar King	759	106.2	100.5	123.1	.....	.....	.....	.....

[1] Average of two check plats.
[2] Yields not comparable, due to poor stand resulting from seed treatment for smut.

Reference to Table LII shows that of the eight varieties which have been grown for five years the Early Mountain and Golden Rain only slightly outyielded the Kherson, with the Silvermine equaling the Kherson in yield. All of the midseason varieties except Lincoln, however, have outyielded the Sixty-Day in that period. In the 2-year period, 1916 and 1917, the Kherson has outyielded all others. The Albion (Iowa No. 103), a white selection from Kherson, has averaged only 3 bushels less. Indications are that this new oat is of considerable promise for irrigated conditions in southern Idaho.

[1] The data here presented are from unpublished reports of Mr. L. C. Aicher, the superintendent of the Aberdeen substation, to the Office of Cereal Investigations.

FIG. 14.—Panicle and spikelets of a midseason yellow variety of oats, Golden Rain.

Tartar King, the one late side variety which has been tested, has fallen decidedly below both the early and midseason varieties in average yield per acre and has been discarded. A panicle and spikelets of Golden Rain, a midseason yellow variety of oats, are shown in figure 14.

RESULTS AT GOODING.

Average yields of the Kherson, the Sixty-Day, and eight other varieties of oats grown during one or more years in the 6-year period from 1910 to 1916, inclusive, under irrigation at Gooding, Idaho (48), are shown in Table LIII.

Unfortunately, the Kherson and the Sixty-Day were included in the experiments at Gooding during only one year, and as a result sufficient data on these varieties are not available to justify drawing definite conclusions regarding their value. The data shown in Table LIII indicate, however, that the best midseason white varieties will probably outyield them in most years. The contradictory results obtained here and at Aberdeen are perhaps due to the lower altitude at Gooding, with the resultant longer and warmer growing season.

TABLE LIII.—*Average yields of the Kherson, the Sixty-Day, and eight other varieties of oats grown under irrigation at the Gooding (Idaho) substation during one or more years in the 6-year period from 1910 to 1916, inclusive.*

[Data compiled from Idaho Agricultural Experiment Station Bulletin 93 (48).]

Group and variety.	Length of record.	Yield per acre.	Group and variety.	Length of record.	Yield per acre.
Early yellow:	*Years.*	*Bushels.*	Midseason white—Continued.	*Years.*	*Bushels.*
Kherson	1	71.1	Victory	6	86.6
Sixty-Day	1	61.0	Danish Island	6	86.6
Midseason yellow:			Lincoln	6	86.2
Golden Rain	6	83.4	Swedish Select	5	96.6
Midseason white:			Wisconsin Pedigreed No. 1	4	96.5
Colorado No. 37	6	88.2	Late white (side):		
Big Four	6	87.4	White Russian	5	82.4

Results under Irrigation in Nevada.

The annual and average yields of the Kherson, the Sixty-Day, and several other varieties of oats grown under irrigation at the Nevada Agricultural Experiment Station at Reno (22, p. 31–34) during two or more years in the 3-year period from 1914 to 1916, inclusive, are shown in Table LIV.

TABLE LIV.—*Annual and average yields of the Kherson, Sixty-Day, and nine other varieties of oats grown at the Nevada Agricultural Experiment Station (at Reno) during two or more years of the 3-year period from 1914 to 1916, inclusive.*

[Data compiled from Nevada Agricultural Experiment Station Bulletin 89 (22, p. 31–34).]

Group and variety.	Yield per acre (bushels).				
	1914	1915	1916	Average.	
				1914 to 1916	1915 and 1916
Early yellow:					
Kherson	44.5	51.8	31.1	42.5	41.5
Sixty-Day	21.7	29.5	.....	.....	.....
Midseason white:					
Big Four	25.4	59.2	50.4	45.0	54.8
Garton No. 572[1]	20.7	69.5	41.9	44.0	55.7
Danish	35.1	52.4	46.7	44.7	49.6
Siberian	24.6	64.5	45.0	44.7	54.8
Midseason black:					
Black American[2]	.....	57.6	60.5	.....	59.1
Missouri Black[3]	12.6	63.1	39.9	38.5	51.5
Late white (side):					
Sparrowbill	35.8	52.4	.....	.....	.....

[1] Probably identical with Lincoln. [2] Cereal Investigations No. 549. [3] Probably Monarch.

The data shown in Table LIV are the yields from very small plats, not replicated sufficiently to eliminate a high percentage of experimental error. The midseason varieties outyielded the Kherson and the Sixty-Day by a sufficiently wide margin, however, to indicate that they are to be preferred for growing under irrigation in western Nevada, although climatic conditions appear to favor early oats.

In reporting his results, Professor Knight states:

> The lack of humidity together with the intense heat of the sun during the ripening period often causes the panicles to blast and turn white before the grain is fully developed and while the culms and leaves are still green. When affected this way, a large portion of the oats shatters to the ground before and during harvest.

Conclusions.

The average yield of the leading variety in each group at the stations where experiments have been made under irrigation in the northern Great Plains and western basin areas is shown graphically in figure 15.

From the data presented in the preceding pages it appears that in irrigated districts where early frosts may be expected the early

yellow varieties are to be recommended. Otherwise, the midseason white varieties, such as Silvermine, Swedish Select, and Early Mountain, are the most desirable for growing under irrigation in the western United States.

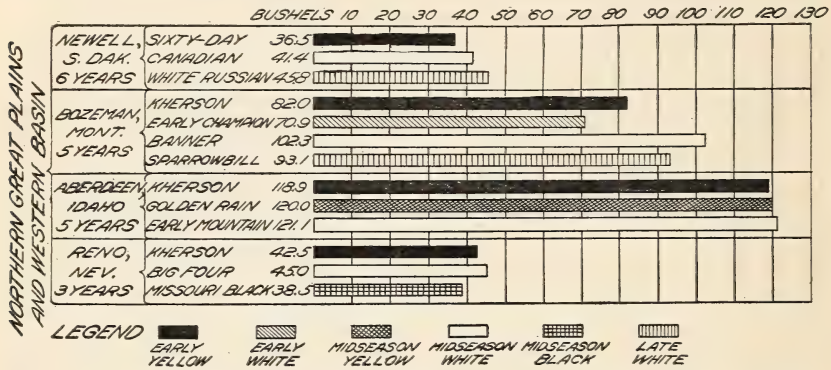

FIG. 15.—Diagram showing the average yields, in bushels per acre, of the highest yielding variety of each of several groups of oats under irrigated conditions at four agricultural experiment stations in the northern Great Plains and western basin areas during the periods of years indicated.

SUMMARY OF DATA.

The name and average yield of the highest yielding variety of early oats grown under humid, subhumid, semiarid, or irrigated conditions, at each of the 48 stations discussed in this bulletin, are shown in Table LV. In parallel columns also are presented the names and average yields of the highest yielding midseason and late varieties, which were grown at the stations in the same period of years except where otherwise indicated. The length of the periods is indicated in the second column.

TABLE LV.—*Average yields per acre of the highest yielding variety of early, midseason, and late oats grown under humid, subhumid, semiarid, or irrigated conditions at 48 experiment stations in the United States.*

Section and station.	Length of record.	Variety.					
		Early.	Yield.	Midseason.	Yield.	Late.	Yield.
North Atlantic (humid):	*Years.*		*Bush.*		*Bush.*		*Bush.*
Orono, Me.	6	Kherson	63.4	Banner	69.7	Senator	56.4
Durham, N. H.	4	do.[1]	35.6	Hamilton	39.3	Long's White Tartar.	42.2
Ithaca, N. Y.	11	Sixty-Day	55.1	Welcome	59.3		
State College, Pa.	4	do	64.5	Joanette[2]	60.7	Long's White Tartar.	61.9
East North-Central States (humid):							
Wooster, Ohio	9	Sixty-Day	68.2	Siberian	71.3	Long's White Tartar.	65.2
Purdue, Ind.	4	Red Rust-proof.[3]	48.7	Great Dakota.	54.0		
Madison, Wis.	3	Sixty-Day	57.6	Wisconsin Wonder.	41.0	White Russian	30.8
De Kalb, Ill.	4	do	54.2	Schoenen	61.3		
Urbana, Ill.	11	do	58.1	Siberian	52.5		
Fairfield, Ill.	2	Red Rust-proof.[4]	47.1	White Bonanza.	35.0		

[1] Average for two years only.
[2] The average yield for the midseason white variety, Japan, is 60 bushels.
[3] The average yield for the Sixty-Day variety is 47.2 bushels.
[4] The average yield for the Sixty-Day variety is 37.3 bushels.

TABLE LV.—*Average yields per acre of the highest yielding variety of early, midseason, and late oats grown under humid, subhumid, semiarid, or irrigated conditions at 48 experiment stations in the United States*—Continued.

Section and station.	Length of record.	Variety.					
		Early.	Yield.	Midseason.	Yield.	Late.	Yield.
West North-Central States (humid to subhumid):	*Years.*		*Bush.*		*Bush.*		*Bush.*
St. Paul, Minn.	3	Sixty-Day	61.1	Myrick Banner	60.5	White Russian	52.4
Crookston, Minn.	5	do	53.2	King Oscar	57.4	do	52.8
Grand Rapids, Minn.	2	Kherson	84.1	Banner	79.6	do	78.9
Fargo, N. Dak.	7	Sixty-Day	63.5	Big Four	59.8	Tartar	60.8
Brookings, S. Dak.	14	do	58.1	Swedish Select	47.9		
Ames, Iowa	7	Richland	60.5	Silvermine	57.6	White Russian	46.1
Lincoln, Nebr.	14	Burt [1]	58.2	Swedish Select	47.2		
Manhattan, Kans.	7	Red Algerian [2]	40.9	Green Russian	35.3		
Lower Mississippi Valley (humid):							
Knoxville, Tenn.	5	Kherson [3]	31.2				
Carthage, Mo.	4	Red Rust-proof. [4]	24.5	Lincoln	23.5	White Tartar	25.2
Fayetteville, Ark.	5	Burt [5]	36.4				
McPherson, Kans.	4	Sixty-Day [6]	37.6	Canadian	22.6	White Tartar	26.8
Denton, Tex.	3	Red Rust-proof. [7]	41.4				
Northern Great Plains (semiarid):							
Moccasin, Mont.	9	Sixty-Day	58.3	Swedish Select	46.0	White Tartar [8]	24.7
Williston, N. Dak.	10	do	50.6	Abundance	71.5	White Russian	61.5
Dickinson, N. Dak.	11	Kherson	51.1	Golden Rain	53.5	do	39.2
Mandan, N. Dak.	2	Sixty-Day	43.9	do	49.0	do	42.8
Langdon, N. Dak.	5	do	41.2	Siberian	54.4	do	57.5
Edgeley, N. Dak.	8	do	42.4	do	45.5	do [9]	37.4
Newell, S. Dak.	6	do	40.9	Swedish Select	31.8	do	29.4
Cottonwood, S. Dak.	9	do	12.9	do	7.4		
Eureka, S. Dak.	9	do	37.1	do	32.3		
Highmore, S. Dak.	12	do	37.0	do	30.8		
North Platte, Nebr.	6	Kherson	35.4				
Archer, Wyo.	5	Sixty-Day	21.7	Swedish Select	26.4	Black Tartarian.	20.9
Akron, Colo.	10	Kherson	38.9	Colorado No. 37	36.6	White Tartar [9]	26.5
Southern Great Plains (semiarid):							
Hays, Kans.	4	Burt × Sixty-Day hybrid.	14.8				
Amarillo, Tex.	11	Red Algerian [10]	20.6				
Western basin and coast areas (semiarid):							
Nephi, Utah	10	Sixty-Day	15.5	Swedish Select	20.6		
Aberdeen, Idaho	3	do	24.5	"Rustless"	24.2		
Burns, Oreg.	5	Kherson	30.7	do	34.2		
Moro, Oreg.	7	do	48.7	Siberian	49.2		
Pullman, Wash.	2	Sixty-Day	77.3	Abundance	81.8		
Puyallup, Wash.	3	do	51.7	Swedish Select	63.2	Sparrowbill	59.4
Chico, Calif.	4	Red Rust-proof. [11]	35.2	Danish Island	32.9		
Northern Great Plains and western basin areas (irrigated):							
Newell, S. Dak.	6	Sixty-Day	36.5	Canadian	41.4	White Russian	45.8
Bozeman, Mont.	5	Kherson	82.0	Banner	102.3	Sparrowbill	93.1
Aberdeen, Idaho	5	do	118.9	Early Mountain.	121.1		
Gooding, Idaho	5	do [12]	71.1	Swedish Select	96.6	White Russian	82.4
Reno, Nev.	3	do	42.5	Big Four	45.0	Sparrowbill [13]	43.8

[1] The average yield for the Kherson variety is 55.0 bushels.
[2] The average yield for the Kherson variety is 36.9 bushels.
[3] The average yield for the Burt variety is 31.1 bushels.
[4] The average yield for the Kherson variety is 24.4 bushels.
[5] The average yield for the Kherson variety is 31.3 bushels.
[6] The average yield for the Georgia Rustproof variety is 34.6 bushels.
[7] The average yield for the Sixty-Day variety is 38.4 bushels.
[8] Average for four years only.
[9] Average for six years only.
[10] The average yield for the Sixty-Day variety is 18.9 bushels.
[11] The average yield for the Sixty-Day variety is 32.6 bushels.
[12] Yield for one year only.
[13] Average for two years only.

The summary of average yields presented in Table LV indicates that at more than 50 per cent of the stations under a wide range of climatic conditions, early varieties have outyielded midseason and late varieties. The early varieties, Kherson and Sixty-Day, have given the best results in the warmer humid, subhumid, and semiarid sections. Late varieties have been superior in yield to those of the midseason group at only a few stations.

GENERAL CONCLUSIONS.

In general, the early varieties, Kherson and Sixty-Day, yield well in most of the spring-oat sections of the United States.

In New York and the New England States the best midseason varieties, such as Welcome, Banner, Lincoln, Swedish Select, etc., outyield the Kherson and Sixty-Day and therefore are recommended for growing.

In the higher central and western portions of Pennsylvania, and in western Maryland, northwestern Virginia, and West Virginia, early varieties are superior to midseason or late varieties.

In Ohio there is little choice between early and midseason varieties. Results in Indiana favor the midseason varieties for the central and northern sections of that State.

In central Illinois strains of the Kherson or Sixty-Day type outyield those of the midseason varieties and are preferable for this section. In northern Illinois the midseason varieties are slightly superior.

In southern Indiana and Illinois the early red varieties, such as Red Rustproof and Burt, are the most dependable.

In Michigan and Wisconsin, where conditions are similar to those of New York and New England, midseason varieties outyield the Kherson and Sixty-Day and are recommended.

In most sections of Iowa and in southern Minnesota, southeastern North Dakota, and eastern South Dakota, early oats are well adapted and outyield practically all other varieties.

In northern Minnesota midseason varieties apparently are best adapted.

In the eastern half of Nebraska, Kansas, and Oklahoma, in Missouri and Arkansas, and in western Kentucky and Tennessee, early oats are best adapted. In general the early red varieties, Red Rustproof and Burt, take first rank, with the Kherson and Sixty-Day close competitors in many districts.

In the southern Great Plains under semiarid conditions early varieties are superior. Red Rustproof, Red Algerian, and Burt are the best adapted varieties, with Kherson and Sixty-Day the next best. However, the latter are not as close competitors in this section

as in the subhumid portion of the section just to the east, mentioned in the preceding paragraph.

Except at the higher altitudes in the northern Great Plains and at the extreme north, Kherson and Sixty-Day oats usually slightly outyield other varieties. In central and western North Dakota the climatic conditions usually favor the larger midseason varieties.

In the western basin and coast areas, under dry-land conditions, Kherson and Sixty-Day produce nearly as high yields as the best midseason varieties and frequently are preferable, especially in those sections with high altitudes and a short growing season.

Under irrigation in the western United States, midseason white varieties, such as Silvermine, Swedish Select, and Early Mountain, are the most desirable to grow, except that in sections where early rosts may be expected the early varieties, Kherson and Sixty-Day, are recommended. Better results than were expected have been obtained from these early short-strawed varieties when grown under irrigation in comparison with the larger and later varieties.

YIELD OF STRAW, BUSHEL WEIGHT, AND IMPROVEMENT DATA.

Primarily because of the characteristic short, slender culms of the Kherson and Sixty-Day varieties, they do not produce large yields of straw. In sections where straw is relatively valuable for feed, varieties that are low in yield of straw frequently are undesirable. On the average, these early varieties produce from 20 to 30 per cent less straw than the midseason varieties.

In weight per bushel, oats of the Kherson and Sixty-Day type usually fall several pounds below the larger kerneled midseason varieties. This lower weight per measured bushel, however, is more than offset by the lower percentage of hull, which gives them a higher feeding value than other varieties.

One of the objections made most frequently against the early varieties, Kherson and Sixty-Day, is the yellow color of the kernel. In order to eliminate this somewhat undesirable character a number of white-kerneled strains have been developed by selection from the original varieties. Several of these are of considerable promise and are now being grown commercially. Some excellent yellow strains also have been developed. Of these, the most conspicuous is the Richland, a very high-yielding short-strawed variety developed by the Iowa Agricultural Experiment Station, in cooperation with the Office of Cereal Investigations. As yet no variety of any importance has been developed from crosses between the Kherson or Sixty-Day and other varieties.

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